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JOURNAL

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Vol. VI.

MARCH, 1898.

No. 1.

THE LIFE-HISTORIES OF THE NEW YORK SLUG CATERpillars.—XIII-XIV.

PLATE I, FIGS. 1-12.

BY HARRISON G. DYAR, A.M., PH.D.

Packardia geminata Packard.

1864—*Cyrtosia geminata* PACKARD, Proc. Ent. Soc. Phil. III, 343.

1864—*Cyrtosia albipunctata* PACKARD, Proc. Ent. Soc. Phil. III, 344.

1865—*Cyrtosia ocellata* GROTE, Proc. Ent. Soc. Phil. IV, 322.

1866—*Packardia geminata* GROTE & ROBINSON, Ann. Lyc. N. H. N. Y. VIII,
373.

1880—*Packardia goodellii* GROTE, Can. Ent. XII, 242.

1894—*Packardia geminata, albipunctata* NEUMOEGER & DYAR, Journ. N. Y.
Ent. Soc. II, 109.

LARVA.

1891—DYAR, Trans. Am. Ent. Soc. XVIII, 157.

1891—DYAR, Can. Ent. XXIII, 277.

1893—PACKARD, Proc. Am. Phil. Soc. XXXI, 107. (as "Larva of *Hetero-
genea* (*Tortricidia* ?)")

1894—DYAR, Ann. N. Y. Acad. Sci. VIII, 222.

SPECIAL STRUCTURAL CHARACTERS.

Dorsal space moderately broad, flat, narrowing to both extremities, arched; lateral space broad, oblique, narrowing to the ends; subventral space two-thirds as wide as the lateral one, distinct, only slightly retreating, suddenly narrowed in front, tapering behind. Ridges tubercular and setiferous till the last molt, then smooth; subdorsal ridge obsolete, indicated by the rounded angular change in direction between back and sides; lateral ridge slight, dividing the lateral and subventral spaces, subtubercular even in the last stage. Setæ at last rudimentary; in stage I with the structure and arrangement of *Apoda y-inversa* except that the subdorsal spines have the short branch very

rudimentary and the third spine of joint 2 is lacking. Body elongated, sides subparallel, rounded toward the anterior end, joint 13 produced into a slender pointed tail. Skin covered with large, irregular, conic not contiguous, clear granules. Depressed spaces (1) to (8) present, small, ill defined, but devoid of the coarse granules. Color very whitish green, opaque; a white line along the subdorsal ridge with upper dark green, clear border. The centers of the depressed spaces are also whitish, but obscured in the general white shading; (1) and (4) have green centers, but not contrasting. A fainter white line along lateral ridge and subventral edge. The larva is whiter than the backs of the leaves on which it rests, a condition necessary to offset the dark shade which its thickness produces when looked at from beneath. The larva stands about on the same level as *A. y-inversa* in degree of specialization, exceeding it in the presence of the tail-like modification and slightly more reduced setæ of stage I, but falling behind in coloration.

AFFINITIES, HABITS, ETC.

This species belongs to the group of which *Apoda biguttata* is typical, the palaearctic smooth Eucleids. It departs a little from this type as noted above, but not in important characters. Its nearest ally is the other species of the genus, *P. elegans*. The moths emerge unusually early in the season, at the same time as *Tortricidia testacea*, at or before the middle of June. The females rest quietly and do not fly at all till after pairing, even though several nights intervene.* Normally emergence from the pupa takes place during the day, the moths pair the subsequent night and the eggs are deposited in the next night. Flight of the males begins rather late at night, not till after 9:30 P. M. The eggs are deposited singly on the under side of the leaves. The larvæ frequent dry woods and bushes on the edges of fields. They do not inhabit damp or dark locations. Very often the larvæ are found on low small plants only a few inches from the ground, and they are never high feeders. Larvæ occurred not uncommonly at Bellport, Long Island, in a dry pine and oak woods on small wild cherry bushes which had about six leaves apiece and did not exceed a foot in height.

* Most ♀ Eucleids fly on the second night after emergence, and if not mated the previous night, refuse the ♂ entirely. *Phobetron* and *Calybia* are an exception, for they will mate after an infertile flight, but in this case the eggs are without vitality, most only proceeding to the first embryonic stages, and those that do hatch never live to mature.

This species has a northern range. I obtained it at Jefferson Highlands, N. H., in the White Mountains, where only a few species of Eucleidæ are found. Its southern limit is not known, though it occurs throughout New York. It is one of our rarer species, yet locally fairly common.

There are six or seven stages. The former number is here described. When seven stages occur, the extra one is interpolated after stage *V*. It resembles stage *V* closely, the white depressed spaces being a little more distinct, setæ large. The larva under observation fell behind in length from the measurements given more and more in each stage, but attained the same final size, owing to the extra stage. The young larva possesses distinct urticating power, in spite of the absence of stinging spines. The sharp setæ, though not converted into true spines, probably function similarly.

CRITICISM OF PREVIOUS DESCRIPTIONS.

I have given the characters of the mature larva several times. I suppose Dr. Packard's brief description of an unidentified form to have been taken from this species, although the description is scarcely determinate. It could hardly be anything else, however.

In the present descriptions I have gone a little beyond my brief in including in the synonymy the dark forms *albipunctata*, *goodellii* and *ocellata*. Nothing but the pale form *geminata* was bred from these larvæ, so that there is a possibility of another species.

DESCRIPTION OF THE SEVERAL STAGES IN DETAIL.

Egg.—Rather narrowly elliptical, flat as usual, translucent white on glass, shining like a wet spot on the back of the leaf; $1.3 \times .7 \times .1$ mm. Reticulations rather distinct all over the egg, but much rounded, like circular shallow pits, varying a little in size. They hatch in 14 days.

Stage I.—Rounded, thick, tail rounded; spaces all of moderate width, the subventral one small. Color translucent whitish. Spines transparent, short, clubbed-tipped, the subdorsal ones on joints 5, 7 and 9, leaning out slightly and the lateral one of joint 5 leaning up. Joint 2 not much retracted, a large cervical shield with several fine setæ. The subdorsal spines on joints 4–12 have just a trace of the side branch, seen in certain lights as a small irregularity. Skin smooth; slight segmental hollows are present dorsally at the upper sides of the bases of the tubercles. Arrangement of the setæ (Plate I, fig. 2), as in *Apoda y-inversa* except that there is only one middle seta on joint 4. The outer third

of the seta is everted from the middle portion on hatching, sometimes remaining incompletely so. No spines present on first emerging from the egg. Length, .9-1.7 mm.

Stage II.—(Plate I, fig. 2.)—Rather elongated, elliptical, tail rounded quadrate, joint 3 truncate in front. Setæ normal, two on the subdorsal ridge, one on the lateral, distinct, long, sharp pointed. The middle row on the thorax is represented by two setæ on joint 3, and by one only or a large and a small one on joint 4. Ridges distinct, the dorsum and sides concave. Head retracted; joint 2 partly so. Skin rather densely frosted with clear conic granules, not contiguous, nowhere produced into secondary spines. Depressed spaces hardly indicated (1) as slight hollows, not differentiated by the granules and very small. Color pale whitish green, evenly tinted. Length, 1.6-2.5 mm.

Stage III.—Narrowly elliptical, tail small, square. Dorsal and lateral spaces broad, subventral smaller. Ridges marked, high, segmentarily tubercular, the setæ stiff, black, distinct. Color plate translucent whitish green, a faint white line under the subdorsal ridge, not reaching either extremity. Skin with remote, low, rounded granules (Plate I, fig. 4), no spines anywhere. Depressed spaces small, shallow, not sharp edged, smooth in the bottom. Length, 2.3-3.5 mm.

Stage IV.—Elliptical, tail produced a little and tapering, notched. Whitish green, a distinct white band below the skin of subdorsal ridge on joints 4-13. Lateral ridge prominent, even with the subventral edge or a little beyond it. Dorsal impressed whitish dots (1) distinct on the central segments, interrupting the faint green line of the dorsal vessel. Skin smooth except for the remote, irregular, clear granules, the surface slightly sunken to represent the depressed spaces. Length, 3.5-5.2 mm.

Stage V.—Somewhat more like mature larva; tail truncate. Skin more densely clear granular, the granules nearly contiguous. Subdorsal ridge with a distinct yellowish white line on joints 3-13; a row of dorsal dots (1), only five of them distinct (joints 5-9). Ridges gently undulating from the outline of rudimentary tubercles. Setæ short, distinct. Depressed spaces indicated, but like the rest of the skin, granular. Color, translucent green, dark, not yellowish. Head green, eyes black. Length, 5.2-7 mm.

Stage VI.—(Plate I, fig. 6.) Shape as described. Skin granules transparent, contiguous, covering the whole surface. Depressed spaces very small, the dorsal (1) smooth, whitish with green centers; addorsal ones (2) absent on the surface, but represented by white dots below the

skin. Lateral large areas (4) and (6), indicated by pigment under the granules, the smaller ones not represented. Tubercles obsolete, setæ minute. The body is elongate, rather narrow, highest through joints 7-8. Color, whitish green, becoming whiter during the stage as the pigment is slowly deposited. A dorsal green line interrupted by the dorsal impressed spots, subdorsal lines straight, yellowish white, connected on joint 3 and on the tail, edged above with dark green. A row of white dashes on the lateral ridge, the large depressed spaces (4) becoming whitish with dark centers like (1). Length, 7-11.5 mm.

Cocoon and pupa as usual.

Food-plants.—Wild cherry, white birch, black birch, oak, bayberry, sour gum, hickory and *Clethra alnifolia* have been observed.

Packardia elegans Packard.

1864—*Cyrtosia elegans* PACKARD, Proc. Ent. Soc. Phil. III, 342.

1864—*Cyrtosia fusca* PACKARD, Proc. Ent. Soc. Phil. III, 343.

1881—*Packardia nigripunctata* GOODELL, Can. Ent. XIII, 30.

1891—*Packardia elegans* DYAR, Trans. Am. Ent. Soc. XVIII, 157.

1894—*Packardia elegans* NEUMOEGER & DYAR, Journ. N. Y. Ent. Soc. II, 76.

LARVA.

1864—PACKARD, Proc. Ent. Soc. Phil. III, 343 (cocoon; no larva).

1881—GOODELL, Can. Ent. XIII, 31 (brief desc.).

1890—PACKARD, 5, Rept. U. S. Ent. Comm. 149 (quotes Goodell).

1891—DYAR, Can. Ent. XXIII, 277.

1893—PACKARD, Proc. Am. Phil. Soc. XXXI, 100.

1894—DYAR, Ann. N. Y. Acad. Sci. VIII, 222.

SPECIAL STRUCTURAL CHARACTERS.

Elongate elliptical, rounded before, joint 13 produced into a pointed tail. Dorsal space rather narrow, diminishing a little at the ends, slightly arched, highest at joints 6-7; lateral space broad, concave; subventral space broad, narrowly retracted in the middle. Ridges moderate, the lateral the most distinct, subtubercular, setiferous; smooth in the last stage. Skin rather coarsely clear granular, always without secondary spines. Depressed spaces feebly developed, (1) and (4) show faintly as pale rings, seen by transparency as if at the bottom of pits with convergent sides. Pigment unusually scanty; a band of green color extends along the upper half of lateral area below the subdorsal ridge, elsewhere the body is transparent, faintly colored greenish by the blood. Dorsal vessel plainly seen and the contents of alimentary canal, showing through the dorsal space. At the end of the last stage the

pigment fills in somewhat better. Tail conic, setæ of joint 13 widely separated on it. First stage as in *P. geminata*.

AFFINITIES, HABITS, ETC.

Closely allied to *Packardia geminata*, differing only slightly. The granulation is more dense, appearing earlier in ontogeny, but the pigmentation is much degenerated. The moths do not emerge as early in the season as *P. geminata*, yet fairly early, June 25th to July 2d, in my examples. The females are less quiescent than the allied species and fly violently if not mated the first night after emergence. After this night they will not mate at all, even though males be present, but continue to lay infertile eggs, or else refuse to lay and die in a few days. The eggs are deposited singly on the under sides of the leaves where the larvæ live.* The larvæ frequent dark woods. The deep shade seems to be the essential factor as they will occur in any woods whether wet or dry if dark enough. I have found them on the thin pale leaves in the dry woods on Goat Island at Niagara Falls and also in an almost swampy grove in Van Cortlandt Park, New York City. I have found them on Long Island, not commonly, as dark woods are rare on the Island. The larvæ are low feeders, but not so low as *P. geminata*. As in the case of its ally, the larvæ can be found in fair numbers by looking in the right places. Except by breeding the moth is seldom taken.

CRITICISM OF PREVIOUS DESCRIPTIONS.

Mr. Goodell mentions the larva without detailed description. Subsequently it has been described adequately by Dr. Packard and myself. Dr. Packard describes a series of dorsal dark green spots which he says "does not form a tubercle or flattened wart." This is, indeed, very true, because the spot is the center of the dorsal depressed space. I suppose the only reason for making this statement to be the same false idea of the homology of these structures to which I have referred under *Tortricidia fasciola*.

* Professor Poulton remarks (Trans. Ent. Soc. London, 1888, p. 591), "it is well known that these larvæ (Eucleidæ) rest on the upper surface of the leaves of their food plants." I cannot imagine on what this statement is based. Of the nineteen species of North American larvæ now well known to me, only one (*Phobetron pithecium*) ever rests on the upper side of the leaf, and this in the last stage only when its peculiar shape and color make it resemble a piece of dead leaf that had fallen from above. I cannot well believe that the two European species have different habits from our smooth Palearctic Eucleids.

DESCRIPTION OF THE SEVERAL STAGES IN DETAIL.

Egg.—Elliptical, flat, $1.0 \times .6 \times .1$ mm.; whitish transparent, colorless. Reticulations distinct, irregularly quadrangular, narrow, raised. In the bright light with the green leaf behind they appear as narrow black lines, bordered by a bright area on both sides, the flat cell-areas dusky grayish. They hatch in 10 or 11 days.

Stage I.—Just like *P. geminata*, the spines arranged the same (Plate I, fig. 1); all short with irregularly knobbed tips. Branches of the sub-dorsal spines just distinguishable as little protuberances. Elliptical, rounded, dorsum and sides grooved, subventral space small. Ridges smooth, setæ colorless. Skin shining, smooth, colorless, transparent; food green; head concolorous. Length, .8–1.4 mm.

Stage II.—Obscure, not shining, pale whitish, just tinted with green, translucent. Elongate elliptical, narrow, the tail narrowly quadrate. Ridges slight, non-tubercular, two setæ on subdorsal ridge, one on lateral ridge, normal, except only one on the middle row of joint 4; black tipped and with stout expanded bases. Skin granules small, sparse, low conic, clear, alike everywhere, not produced on the ridges. The largest depressed spaces, (1) and (4), are indicated as slight hollows. Length, 1.3–2.1 mm.

Stage III.—Elongate elliptical, narrowing posteriorly, tail rounded, not produced. All frosted whitish, scarcely tinted with green. Setæ distinct, sharp, black tipped, arising from slight tubercles on the subdorsal ridge, distinct conic segmentary ones on the lateral ridge. All of skin surface and tubercles covered densely with small low conic clear granules, uniformly even over the obsolete depressed spaces, where they are scarcely thinner. The granules are very numerous, almost contiguous, but rounded, not appressed. (Plate I, fig. 5.) The shape is now unusually narrow, dorsal space not narrowing much to the ends. Very colorless, translucent, the blood only slightly green and no pigment present. Length, 1.8–3.0 mm.

Stage IV.—Narrow, elongate, truncate before; tail produced, but tubercular like the ridges. Frosted whitish from the granules and, therefore, slightly opaque; almost entirely without pigment, the blood visible pulsating, slightly green tinted. An obscure whitish dot under the subdorsal ridge at each intersegmental space, representing a subdorsal line. Setæ short, black and distinct. Granules small, even, dense, but not quite contiguous, running uniformly over the whole surface; depressed spaces scarcely indicated anywhere. Length, 2.8–4.0 mm.

Stage V.—Elongate, anterior end rounded, posterior pointed but without a well formed tail. Dorsal space moderate, even, but little arched, lateral broad, subventral moderate. Ridges low tubercular, with distinct dark setæ. Skin clear granular, whitish; all very transparent, green pigment only in the upper half of lateral space, none in dorsal space which appears darker from the food showing by transparency. A waved subdorsal line, bent inward on the interspaces, free at the ends. Depressed spaces not visible, except faint white rings to represent the lateral ones (4). Length, 3.8–5.8 mm.

Stage VI.—Narrowly elliptical with a pointed tail; setæ short, black, distinct. Pigment in the upper half of lateral space, the rest of the body clear green from the blood, translucent and whitish in the edges. A wavy yellow subdorsal line, free at the ends. Dorsal depressed spaces (1) very faintly indicated by whitish dots, visible centrally only; lateral (4) as large intersegmental white rings, but probably at least the glands of all the spaces (1)–(8) are present, as drops of moisture were observed in the appropriate position of them all in the larva under observation. Skin granules rather coarse, dense, but not contiguous, the depressed spaces not differentiated. Length, 5.0–8.5 mm.

Stage VII.—(Plate I, fig. 9, 10). Shape as described. Patches of pigment in the dorsal space surround the rings of depressed spaces (1). Light yellowish green, lateral edge clearer, dorsal space darker. A waved, narrow, yellow, subdorsal line, free at the ends; tail reddish brown above. The absence of pigment in the dorsal space makes it look hollow, though it is really flat. Six of the depressed spaces (1) are visible as white rings, around which more or less light emerald green pigment forms in rings, transverse bands or even filling all of the dorsal space (Plate I, fig. 10.). The subdorsal line is composed of a series of intersegmental, inwardly lunate, joined yellow marks. Lateral space to lower edge of depressed spaces (4) pigmented light green, (4) large pale rings with dark centers. A trace of pale dots along lateral ridge intersegmentally. Tail long, pointed; setæ very small, pale. Skin granules rather large, somewhat irregular, not quite contiguous, at the largest depressed spaces, (1) and (4), less distinctly granular over the slight hollows. A broken white subventral line. Length, 7.1–13 mm.

Cocoon and pupa as usual.

Food-plants.—Linden, witch-hazel, hop-hornbeam, beech, maple, black birch, wild cherry, sour-gum, black oak, chestnut, hickory and *Leucothoë racemosa*, have been observed.

EXPLANATION OF PLATE I.

- Fig. 1. Stage I of *Packardia*, dorsal view, enlarged.
 “ 2. Stage II, side view enlarged.
 “ 3. The subdorsal setæ of one tubercle, stage II, more enlarged.
 “ 4. Granules of *Packardia geminata*, stage III, enlarged.
 “ 5. Granules of *Packardia elegans*, stage III, enlarged.
 “ 6. Mature larva *P. geminata*, three-quarters view.
 “ 7. Moth of *P. geminata*.
 “ 8. The same, dark form, var. *albipunctata*.
 “ 9. Mature larva of *P. elegans*, three-quarters view, partially pigmented.
 “ 10. The same, dorsal view, fully pigmented form.
 “ 11. Moth of *P. elegans*.
 “ 12. The same, pale form, var. *fusca*.

AN ATTEMPT TO CLASSIFY THE HOLARCTIC LEPIDOPTERA FROM THE SPECIALIZATION OF THE WINGS.

PART II.—THE HAWK AND EMPEROR MOTHS.

By A. RADCLIFFE GROTE, A.M.

- C. Radius 5-branched; vein IV₂ central or cubital; hindwings with intercostal crossvein.....SPHINGIDES.
- c1. No costal vein (vein I) on primaries; vein III₂ absorbed by Radius; crossvein degenerate; vein IV₂ decidedly cubital....ENDROMIDIDÆ.
- c1. A costal vein (vein I) on primaries; vein III₂ from Radius before extremity of cell; crossvein entire; vein IV₂ not decidedly cubital
SPHINGIDÆ.
- D. Radius 3-4 branched; vein IV₂ central or radial; hindwings with no intercostal crossvein.....SATURNIADES.
- d1. Vein IV₂ continuous with vein IV.....SATURNIADÆ.
d2. Cell openATTACINÆ.
d2. Cell closed.
d3. Hindwings without vein VIII.....SATURNIANÆ.
d3. Hindwings with vein VIII.....HEMILEUCINÆ.
- d1. Vein IV₂ from crossvein.....AGLIADÆ.
- d4. Hindwings without vein VIII.
d5. Crossvein, between IV₂ and IV₁, directed obliquely outwardly
AGLIANÆ.
d5. Crossvein transverse.....AUTOMERINÆ.
- d4. Hindwings with vein VIIICITHERONIADÆ.*

* This table (*C, D*), and that of the Day-Butterflies (*A, B*), is compiled in accordance with the sequence in the Lepidoptera which I recommend, and not altering the Linnean arrangement upon opinionative grounds.

ENDROMIDIDÆ.

The subprimary tubercles of the larva (3 and 5) in stage I are wanting on the thoracic segments (I to III). On the abdominal segments the subprimary tubercle 6 is also wanting. In the "Saturniiden," page 6, I figure abdominal segment, but the bristles marked "6" are too low down for this and evidently belong to 7. I indicate this doubt in the text (p. 5). On the same segments the tubercles 5 and 4 are separate. There appears to me no insuperable objection to the view, that *Endromis* represents an isolated form of the Hawk Moth stem, separating soon after this stem had emerged from the Tineid trunk. The retention of the intercostal vein is then an independent survival of a character shared by both when the Endromid branch made its separate way. Dyar has enabled us to show that the type of the Endromid larva is opposed to the Saturnian and the latter to the Sphingoid type. The neuration excuses me in considering *Endromis* as an aberrant Sphingoid type. It is not improbable that the larva of an existing generalized Sphinx might throw some light on the matter through a comparison of parallel stages. When we turn from the larva to the pupa, we find that the segments of the abdomen are capable of movement in *Endromis* and by their aid the pupa is forced out of the cocoon before exclusion, as in *Anthrocera*, *Cossus* and the Tineides generally. Preparations before me of *Endromis* and *Anthrocera*, hatched in my breeding cages, show a striking similarity in this habit. The Sphingidæ seem to have the habit also, inasmuch as the naked pupa is stated to wriggle its way to the surface of the ground to allow the escape of the moth. Such species as transform on the surface within a slight cocoon have not, to my knowledge, been observed as to this point. This habit indicates a direct connection of the Sphingides with the Tineides. The links between *Endromis* and *Sphinx* appear to have dropped out; also those by which we might more surely trace the relationship between adult forms of the Sphingides and Tineides. Nevertheless, I call attention to the fact that the Anthroceridæ represent a Tineid branch possibly related to the stem which threw off the existing Sphingides.

Leaving these characters, we will consider the neuration. And first the shape of the wings is modified, and this probably in accordance with the method of flight. Disposed as I am to consider the Sphingides and Saturniades as parallel groups, each specialized in a different way, and the Saturniades unquestionably the more highly so, I would compare the Endromididæ with the Saturniadæ and the Sphingidæ with the

Agliadæ (the Citheroniadæ especially). For the moment we will consider and compare the Endromid and Sphingoid wing. The vein on costal edge of primaries (vein I) present in the Hawk Moths is absent in *Endromis*. This vein (or thickening, according to some of the costal edge) is found in the Hesperianæ but not, so far as I know, in the Pamphilinæ. The most striking difference between *Endromis* and *Sphinx*, is found in the evident effort in the former to get rid of vein III₂. This springs from the Radius, near III₁, in the Hawk Moths. In *Endromis* it is absorbed and appears as a short branch before apex.* This is a secondary character, belonging to the general direction of a diminution in the normal number of the radial veins. This direction has apparently been followed out and brought to a higher stage throughout the Saturniades. But the inequality of its expression is here no indication of the phylogeny, seeing that it is everywhere exhibited in different perfection and upon different lines of descent. It is my *second direction* in the general evolution of the lepidopterous wing.

In my *first direction*,† the suppression of the Media, *Endromis* has progressed further than *Sphinx*. For the cubital direction of vein IV₂, often only indicated in the Hawk Moths, here becomes assured and evident. The crossvein already shows signs of degeneration. The wing, in broadening, has lost the strength requisite to sustain swift and prolonged flight. There is, in *Endromis*, a less crowding of the veins; they do not appear so like rigid and parallel rods. There is a larger space between the Cubitus and vein VII, so that VI there appears as a fold in the membrane. Both families retain VIII as a loop to VII on primaries, and there is no trace of other internal veins. On secondaries vein VIII is equally preserved. Looking at the two wings I am met with no character which renders it unlikely that they may have had a common origin. Here is where positive character may be said to end and where the tact and experience of the observer comes into play. But, on the threshold of this disputable region, I can yet point to the intercostal vein and throw the onus of proof on those who dispute the classification. As between *Endromis* and *Sphinx* there is no question which has submitted to most specialization in the neururation. In both

* In *Amphidasys betularia* the absorption of III₂ by III₁ is clearly seen to be in process of being carried out.

† Perhaps we should call this rather the "second direction," seeing that the suppression of the radial veins is used as a primary divisional character of the Suborder, but in the lepidoptera, as we find them now, the breaking up of the median system excites everywhere the chief interest.

main directions *Endromis* shows the most progress. Still, we shall have to discuss the relation between these specializations and habit, although here the matter may detain us no further.

It may be here remarked that it is not strictly correct to speak of the Cubitus "becoming three or four branched." The Cubitus is always two-branched. It is the movement of the lower branches of the Media, which become varyingly attached to the Cubitus, thereby giving the appearance of increasing the number of the cubital veins. In the opposite direction, it is the same way with the Radius.

SPHINGIDÆ.

The absence of homology between the anal horn of the Hawk Moths and the similarly situated hypertrophied tubercle of the Emperor Moths has been determined by Dyar and is illustrated by me in the "Saturniiden," pp. 7-8. The two groups have then no immediate connection and the correspondence with the Citheronians is illusory, the common habit of pupation of secondary acquirement. The venation, both of *Endromis* and *Sphinx*, entirely warrants this view of the case. We need not detain ourselves with these matters here but pass on to the venation. The mass of preparations I have made show me that this offers no characters of precision for a division into subfamilies. The wings appear cast, like iron, into the same mould. Still there is a play with the branches of the Media and it is often not difficult to decide, as between distinct forms, which is the more specialized. Harder to embrace these forms into groups. A form like *Cephonodes picus* seems specialized from the amount of absorption of vein IV₁ by the Radius on primaries, the retreating, almost vanished cell on secondaries, the fusion of IV₃ with VI. *Cephonodes* is more specialized than *Hemaris*. As between *Macroglossum* and *Aellopos* it is hard to distinguish; they seem practically identical. The obliquely transverse and rigid crossvein of primaries is the same and all goes to show that the position assigned by me to *Aellopos* in 1865, among the Macroglossians, is correct and that its placement among the Chærocampians in the Philadelphia List is erroneous. A study of the neurulation seems to favor the idea that the Macroglossians are really the more highly specialized of all the groups. On the other hand, that portion of the hind wing between Cubitus and the anal margin appears generally more lappet-like in the Macroglossians (shared by *Aellopos*) as compared with the Elephant Hawk Moths. There is a decided indentation of the outer margin between V₂ and VII. Almost does this character seem a probable test to distinguish the groups.

Still, it reappears more or less evidently and constantly not only in the Chærocampians but in the Eyed Hawk Moths; an indentation appears in *Sphinx ligustri* and *Hyloicus pinastri* and is replaced by a broad excision between VI and VII in *Dilina tilix*. It appears less evidently in *elpenor* and *lineata*. There seems then mainly the movement in the branches of the Media, which simply affords a criterion for the relative specialization. Judged by this, *Acherontia atropos* is more specialized than the majority of the Smerinthoid types, although it is overlapped by *tilix* and nearly reached by *Smerinthus populi*.* The shape of the secondaries in the Eyed Hawk Moths varies much. This differs even in *Calasymphylus astylus* and *Eusmerinthus geminatus*, while *Copismerinthus ocellata* and the allied North American species are distinguished by the tibial claw.

On the whole, then, the neurulation of the Sphingidæ offers apparently no opposition to the general sequence of Kirby, which is that adopted by me in the Buffalo Catalogues, except that I gave the Eyed Hawk Moths a central position. But, for probably the true reason, viz., that I regarded the Smerinthinæ as nearer a more original Sphingoid type, from which the present groups have emerged in different directions. I was much struck by the resemblance of *Ambulyx* with Smerinthoid genera, and fancied that the Chærocampians might have had a separate and nearer connection with the stem which the Eyed Hawks represent. Hence I gave these a central position. The discovery of *Ambulyx sexoculata* Grote, strengthened this view of the case. But the arrangement of the genera adopted by Kirby is open to betterment in the light thrown by the details of the neurulation. This is, however, a matter for the future student and need not to be here discussed.

From an examination of Siberian and European examples I would here simply correct Kirby's list of the species of *Smerinthus* and *Eusmerinthus* (Cat. pp. 711, 712). *Copismerinthus* is not a synonym of *Eusmerinthus* Kirby, as wrongly cited (p. 712) but of *Smerinthus* Kirby. This author has not understood the character and mixed the species. *Eusmerinthus* wants, *Copismerinthus* has, a tibial claw.

* From a note made by me when examining Latreille's works, *populi* is indicated as the type of *Smerinthus*, by being once solely cited. I regret that my note is not definite and that I have been unable, despite several efforts, to again consult all of Latreille's publications. Kirby prefers *Dilina* of Dalman, 1816, for *tilix*, and this is probably correct.

Eusmerinthus Grt., 1877.Type: *E. geminatus*.

1. *kindermanni* Led.
2. *cæcus* Mén.
3. *planus* Walk.
argus Mén.
4. *geminatus* Say.
? jamaicensis Dru.

Copismerinthus Grt., 1886.Type: *C. cerisii*.

1. *ocellata* Linn.
v. atlanticus Aust.
2. *cerisii* Kirb.
ophthalmicus Boisd.
vancouverensis Butl.
3. ? *saliceti* Boisd.

The classificator must rely in great part on the body characters, the pattern of ornamentation, and, so far as I see, will run no great risk of being contradicted by the neurational features overturning his groupings. Nevertheless, when taking the question of specialization in hand, the neuration will afford him valuable hints which he will do well to respect. As to the name for the above genus (*Copismerinthus*) Kirby has adopted my former and original opinion that *ocellata* was the type of *Smerinthus*, an opinion I retained in my "Hawk Moths of North America." But, from my notes of Latreille, I believe *populi* may be really the true type of his genus. Whichever way the matter is settled, by reference to the original works, I have at least here sorted out the species accordingly as the front tibiæ are or are not armed. The North American genera *Paonias* (for *excæcatus*), *Calasymbolus* (*astylus*) seem to me on other grounds distinct from each other and from the above. (Consult an article on the frenulum of the British species of *Smerinthus*, by Geo. C. Griffiths, Ent. Record. VI, 250.)

SATURNIADES.

In the "Saturniiden," p. 6, I figured the first larval stage of the Silkworm, *Bombyx mori*, showing, from the arrangement of the tubercles, that this larva was related to the large group circumscribed by Dyar and which I had called Agrotides. The Silkworm has therefore to be excluded from the Emperor Moths. The Saturniades, cleared of this foreign element, have been taxonomically defined by Dyar by the presence in the larva of a system of subprimary tubercles, wanting in the Sphingides, as here accepted.* The pupa gives the moth within the cocoon. The Citheronian habit is not recorded. A nearer relationship, such as we can show for the Sphingides, with the Tineides is not yet indicated. There exists a temptation to regard the Ptochopsychidæ

* Mr. Grote has misunderstood me. I separate the Saturniides and Sphingides on the position of tubercle iv; neither group has distinguishable sub-primary tubercles. *Endromis* is a Bombycid except for the absence of sub-primary tubercles in stage I, which I do not regard as a strong character at present. I shall return to this point elsewhere.—H. G. DYAR.

and Psychidæ as standing in a connection with the ancestral line of the Emperor Moths, which may be merely noticed in passing.

Bearing in mind the two directions in which the evolution of the wing is chiefly displayed, we find in the Attacinæ their fullest development. In fact the wing of *Rothschildia jacobæa* represents almost the ideal apex of the movement. In the *first* direction, the Media and its system, as such, has completely disappeared. The crossvein has vanished. Veins IV₂ and IV₁ form part of the system of the Radius, vein IV₃ forms part of that of the Cubitus. That portion of the crossvein, belonging to it morphologically, lying between IV₂ and IV₁, has become physiologically the base of vein IV₂*. In the *second* direction, the radial branches are reduced to three from five. Added to this, the concave inner margin of the secondaries has lost vein VIII. By this latter character we are reminded of *Papilio*, and that the concave margin is a specialization is made clearer in this case by its more excessive development, attended by a shrinking in the length of vein VII, in the more specialized *Parnassius*.

There will come a time, to speak after the fashion of Mr. Strecker, and the ancient Greeks, when the uncritical classification which thrusts the Papilionides between the Blues and the Skippers (these latter two, as we believe, nearly related) will be read with amazement. The fable that the Papilionid wing is the most generalized must give way to the view that it is peculiarly specialized by the suppression of vein VIII of secondaries. Generalized it is, as compared with *Parnassius*, but it should not be compared with the other butterflies, since it has had a different line of development. Undoubtedly, the irritable defense of Mr. W. H. Edwards that *Papilio* has six walking legs and *Nymphalis* only four, was not sufficient to dispel the illusion clinging to the system of Bates. It was also felt that the more ideal championship of Wallace, that *Papilio* was so large and complete, could not excuse its being placed "at the head" of a phalanx in reality, a phalanx spreading over the plain of the present without a leader. All this was perceived, and other similar attacks upon a system adopted by my friend Dr. Scudder, and thus made part of the supreme cult of Boston, fell equally powerless. So that newcomers, rising from obscurity, felt themselves obliged to confess the creed as a matter of "my opinion," and to follow up the futile expression of *credo quia ineptum* by the statement that "the sequence is in accord with the more conservative modern classification." Where this more conservative modern classification leads to we may see

* Compare Mittheilungen aus d. Roemer-Museum, No. 8, p. 24.

in the case of Mr. Meyrick, who puts the Caradrinidæ "at the head." As matters stand Mr. Meyrick will undoubtedly be applauded to the echo by Mr. Hulst. Because, in the Lepidoptera, "students have specialized (!) and few collectors, even, go outside of the Macro-Lepidoptera." Prof. J. B. Smith has, "therefore (?) secured the co-operation of Dr. Henry Skinner in the Rhopalocera;" and Dr. Skinner warrants the endorsement of the Preface of the Philadelphia List by placing the Milkweed Butterfly "at the head" of the "Nymphalidæ." After this specimen of "modern classification" one may well put the List by with the feeling that whatever may be the cardinal error of the Boston creed, neither in Brooklyn or Philadelphia is there any salvation. The suppression of vein VIII of the secondaries, in the most specialized of the Emperor Moths, is a direct monition of the value of the character in the Papilionides. In this latter super-family the more specialized forms show clearly additional features of advancement, so that the lessons taught by the suppression of vein VIII is no longer needed to enable us to appreciate their development. The reason why this was not considered is, that the gauge for specialization offered by the wing was not understood, so that loose notions as to sequence and rank were not only permitted, but, the more bizarre they were the more they were thought "scientific," until at last we are landed in the anarchy offered us by Mr. Meyrick.

The Attacinæ have served us here for a text upon *Papilio*, and to the Emperor Moths we now return. The fact that the diminution of the radial veins in a secondary development, occurring in pursuance of evolutionary law, up and down throughout the more specialized groups (such as the Parnassinæ, Pierinæ, Lycæninæ, Saturniadæ and Agliadæ), is shown by a table published by me separating the genera of Attacinæ as the Radius is 3 or 4 branched. For a study of the whole insect leads me to regard the 3-branched *Philosamia* as a specialization of the 4-branched *Attacus* with which its phylogeny probably lies, rather than as nearly related to *Samia*; with which it has the suppression of III₃ in common.

Leaving the Attacinæ, with open cell, we come to the more generalized Saturnianæ* with the crossvein present and, so far as I can see, almost everywhere at least partially functional. Undoubtedly here is a

* It is more correct to commence with the more generalized forms, but I have become convinced that in the Lepidoptera it will always be more practical to adhere to the Linnean sequence, and this for a variety of reasons, among them this, that the contrary course will never be adopted by "collectors," who will thus be deprived of the light thrown or reflected by "scientists."

gap. The gradual stages of disintegration of the crossvein, such as I found in the Pierinæ and Nymphalinæ I have not so distinctly met with in the Emperor Moths. But the first step towards this stage is marked in the Saturnianæ and has already everywhere attained full expression. It is the conversion of the crossvein between IV_2 and IV_1 into the physiological base of IV_2 , so that the crossvein proper seems to lie merely between IV_2 and IV_3 and we can classify the Saturnianæ under the rubric: vein IV_2 continuous or on a long stem with vein IV_1 . That the Saturnianæ have attained a high relative grade of specialization is seen by the loss of vein VIII on secondaries and the absorption of the radical veins on primaries. They have lagged behind the Attacinæ in the first direction: the suppression of the Media and its system. One point more and I have done with this typical subfamily. In the Saturniades vein VIII appears as a loop to VII on primaries. In *Actias* and *Telca* (proving the relationship of the dissimilar appearing imagos) this vein VIII has an outer inferior spur or prolongation. Is this a trace of the vein VIII in its former position as a parallel vein? Or is it a trace of an absorbed additional vein? Or is it a sporadic, or extra-growth? We notice it in *Castnia*. Its isolated appearance in two Saturnian genera makes it remarkable. Misled by Mr. Meyrick's figures of Geometridæ* I at one time thought the curved internal vein of *Papilio* might correspond to the internal vein figured by him in *Venilia macularia*. But it seems not, since the vein figured by Mr. Meyrick does not exist in the Geometrid form.

Next, we come to the Hemileucinæ, and here is a case of disputed classification, a matter I try here to uncover, with the help of the annexed diagrams of neuration obtained by photographic process. Both Professor Comstock and Dr. Dyar unite my Hemileucinæ with my Automerinae under one "family," which they call Hemileucidæ after Packard. The origin of this notion may be traced back to Grote and Robinson, who, in 1866, established the group Hemileucini with the same contents.† A glance at the figure of the neuration of *Hemileuca maia*, which may also be found in Professor Comstock's beautiful Manual, p. 342 (a book I regret to have only recently become acquainted with), shows that its condition is what we might expect from a more generalized Saturnian. On the secondaries vein VIII is retained, and the retention of this vein is a generalization and repeated everywhere. This affords no proof of the want of relationship between *Hemileuca* and *Saturnia*; if it did, it would equally imply a want of consanguinity

* Consult: Ill. Wochenschrift für Entomologie, Band II, No. 38.

† Ann. Lyc. Nat. Hist. Vol. VIII, 376, October, 1866.

with *Automeris*. But here it is evidently vein VIII which is added to what is, in its total pattern, in its flowing venation, its wide interspacing, its treatment of the Media and its system, its position of vein IV_2 —in all these points—the wing of a Saturnian, not the wing of an Aglian. What the addition of vein VIII makes to the wing of an Aglian we see in *Citheronia*. The student will follow me here better by a glance at the figures given, in this way complying with Hamlet's request to look first on this picture and then on this. How impossible does it not seem, that a classification can be correct (and a classification which represents even approximately the phylogeny) which would derive the Automerid from the Hemileucid wing, or the reverse! Is it conceivable that the malleable Hemileucid wing should have stiffened into the Automerid? Or that the rigid wing of *Citheronia* should have produced both? Or to believe with Dyar, that the wing of *Aglia* could have become transformed into the wing of *Saturnia* and *Attacus*, while the very wing of *Aglia*, its pendant, the wing of *Automeris*, should break out with *Hemileuca*? For those who believe in the "more conservative modern classification" it will be no argument to appeal to Hübner and that this writer considered *maia* to be a *Saturnia*; and, in fact, we see that Hübner was often mistaken, such as Professor Smith never is. But, in spite of all his mistakes, we believe that here Hübner is quite right; right also, in the "Tentamen" and in the "Verzeichniss," in recognizing two main groups of the Emperor Moths, which we call Saturniadæ and Agliadæ, and that *Hemileuca* belongs to the first and *Automeris* to the last. We shall try to make this clearer by our remarks on the next family.

AGLIADÆ.

It is to Dr. Packard that we are indebted for calling our attention to the fact that *Aglia* is a specialized Citheronian, and this from other grounds than the neurulation, grounds we must here pass over. Before taking up the neurulation of the Agliadæ, we will revert for an instant to *Hemileuca* again. The vein we call $III_1 + 2$ in *Hemileuca* springs from the Radius above the cell. In the Agliadæ this is the normal condition of affairs. Its point of emergence travels upwards a little in *Aglia*, as compared with *Automeris*, and herein is the latter the more generalized. But in *Saturnia* it has already been absorbed to a point of issuance from $III_3 + 4$, just before the apex. Now, this is just what we would expect in a generalized Saturnian, and it follows naturally the presence of vein VIII in *Hemileuca*. But the type of *Saturnia*, the long stem upon which IV_1 and IV_2 sit, is already fully developed in *Hemileuca*.

There remains, then, but the absorption of $III_1 + 2$ on primaries, and the loss of VIII on secondaries to evolve out of *Hemileuca* the type of *Saturnia*; and this without violence and following the lines of evolution which we have shown to be followed by the lepidopterous wing. Now to form the Hemileucid wing out of the Citheronian or Automerid type we must have recourse to violence, and this violence is apparently not considered but committed by Professor Comstock and Dr. Dyar.

The neurational type of *Aglia* and *Automeris* is practically identical, so that their position is parallel to that of *Attacus* and *Saturnia*. We may consider them together. They differ exactly by characters on a line with the evolutionary advancement we have everywhere pointed out. In the *first* direction a hesitating and half-expressed step has been taken by *Aglia*. The cross-vein, *still uneven*, still distinctly reminiscent of its true character as a crossvein becomes oblique between IV_2 and IV_1 . In all the Automerinæ from South America I have yet been able to study, the cross-vein is transverse as in *Automeris io*. The point of issuance of $III_1 + 2$ varies somewhat, but little. In this, the *second* direction, as we have above seen, *Aglia* is again more specialized. But otherwise the wings are identical. Neither express any of the distinguishing features of the Saturnian type. Inasmuch as the first direction, the suppression of the Media, is everywhere less progressed, both *Aglia* and *Automeris* are more generalized than the Hemileucid and Saturnian type. In their progression they have lost vein VIII of secondaries, here passing *Hemileuca* by, while the absorption of the radial veins would have rested at the Hemileucid stage. These are all secondary lines of advancement, unequally entered upon. We conclude that *Aglia* represents *Automeris* in the Old World and that it is the more specialized type. Both have sprung from the same near ancestors, the same stem, whether independently, or together, or whether *Aglia* may be looked upon as the outcome of an Automerid form, we can only surmise. But there they are and they belong together, their sundering, by any system of classification, from their common stem, is an act of violence and equivalent to a denial of any lessons to be derived from the neuration, at least so long as their common characters cannot be explained away. We are confident that it is impossible and that the classification we propose is natural and in accordance with the facts.

It does not diminish the difficulty to multiply the families; if we, out of the six subfamily groups originally proposed by me, make, instead of two, the whole six figures as families in our books. Always will *Hemileuca*, *Saturnia* and *Attacus* come together, always will *Citheronia*, *Automeris* and *Aglia* coalesce upon the type of wing. That

there is a difference in the closeness of contact we have urged. This difference is the measure of their nearness to a common ancestor. Thus *Attacus* and *Saturnia* are close together, while *Hemileuca* stands apart a little, still sharing the common type of wing which is indicated by the long stem of the two upper branches of the Media. And *Aglia* and *Automeris* are, in an opposite way, quite nearly related; while *Citheronia* stands still further off from these and is much more by itself, though still exhibiting the Aglian type of wing, the absence of stem to the upper branches of the Media, the transverse cross vein, the stiff, equal distanced, parallel veins. To a brief review of what we have published about *Citheronia* we devote the rest of this paper.

The student must study with this paper what Dr. Dyar has written in Can. Ent., 1896, 303, and the phylogeny there given. The drawing there given is correct, except that I suppose the original Aglian stem (assumed to be represented by the existing Citheronian branch) has given off both *Aglia* and *Automeris*; whether together, or one after another, or whether *Aglia* be an outcome of Automerid-like ancestors, which I am now inclined to assume, I do not decide. My original view of the separation of the six into the two groups is here maintained. I placed *Hemileuca* parallel with *Citheronia*, or but slightly advanced from the difference in general type, from the common retention of vein VIII of secondaries. Above *Citheronia*, as having proceeded from the same stem I placed successively *Automeris* and *Aglia*, the latter being the most specialized. The antennal characters bear out this division. In the Aglian group the female antennæ are short and simple, with few exceptions in specialized forms. In *Attacus* and *Saturnia* they become pectinate. I consider *Citheronia* as specialized in peculiar directions, and as having lost much original character and added new; still, by the retention of vein VIII, as being, rather, the representative in direct line of the original stem. But this view is, for the moment at least, subordinate in importance to the correct placing of *Hemileuca*, to the breaking up of the assemblage of *Automeris* and *Hemileuca* by Grote and Robinson, Packard, Comstock and Dyar. This is the main classificatory result which I believed to have attained in my recent studies of the Emperor Moths. For, whether *Citheronia* represents the main branch (in assuming which I am not a little influenced by Dr. Packard's paper), or whether *Automeris*, is clearly of inferior value to the main fact, that *Aglia*, *Automeris* and *Citheronia* belong together, while *Attacus*, *Saturnia* and *Hemileuca* represent another, and, on the whole, more advanced phylogenetic line upon the same stem. The student

may consult also my illustrated paper in the "Verhandlungen der Gesellschaft Deutscher Naturforscher und Aerzte" 1896, p. 197. In a linear series we would arrange the generic types thus: *Attacus*, *Saturnia*, *Hemileuca*, *Aglia*, *Automeris*, *Citheronia*.

In a foot-note, Journ. N. Y. Ent. Soc., VI, 46, I have written that the crossvein becomes oblique in *Aglia* and *Citheronia*. As I recollect, I had in my mind to write *Eacles*, but a fresh study of the latter genus, and all the Citheronians now accessible to me, has led me to the conclusion that everywhere in this group the crossvein remains transverse. No steps that I can now clearly recognize as such have been taken, as in *Aglia*, towards an independence of IV₂. But even were my former statement correct, the argument supposed to be drawn from it is futile. For the movement is secondary in its nature and would not indicate any necessary nearer connection between *Aglia* and *Citheronia*. What we want is primary character, underlying the general type of the wing and this we have found in the long stem of IV₂ and IV₁ in *Saturnia*, together with the other comparative characters here discussed, as opposed to the issuance of IV₂ from the crossvein in *Aglia*, together with the equally opposing features above summarized.

We have above admitted that the peculiarly Citheronian type of the Agliadæ, stands at a greater distance from *Aglia* and *Automeris* than these two from each other. It remains here to point out these differences and emphasize the conformity to a common type of wing. The wing in the Citheronians has pursued a slightly varying form of specialization of the Media from the other groups of Emperor Moths, one that we meet on occasion again in the Day-Butterflies and also the Hawk Moths. How far this variation is caused by the mechanics of the wing, I cannot now enter upon. Vein IV₁ travels up the lower edge of the Radius, and the extent of its absorption by the Radius is the measure of the specialization of the genera. These stand, in ascending order, *Eacles*, *Citheronia*, *Anisota*. I do not know the neuration of *Sphingicampa*, nor whether it bears out my formerly expressed idea that it stood nearer to *Eacles* than to *Citheronia*. It is probably a specialized form. But although the wings of Citheronians are on the whole perhaps more specialized, as compared with *Automeris*, and in a different way, we have more than a reminder of the Aglian and Automerid pattern. The Radius is four-branched, and this is the natural precusory stage of the three-branched, here the Aglian and Automerid, wing. In *Anisota* vein III₁+₂ has traveled up the Radius and is given off beyond the cell. In the median system vein IV₂ inclines to the Radius, and vein IV₃

comes into near contact with the Cubitus, thus following the course of specialization in the entire group, by which the middle branch of the Media becomes radial in disintegration. But the pattern remains distinctly Aglian, the veins are stiff, tend, even in the most highly specialized forms, to remain equidistant, there is no effort to lead to the Saturnian pattern, indeed there seems no possibility of a progression in this direction, vein IV₁ having taken quite a contrary course, a course entered upon already by the most generalized form, *Eacles*. But this course is possible from the Aglian, not possible from the Saturnian types. Vein VIII of the secondaries is retained, while it is shortening. Knowing, as we do from Dyar's studies, that the larva conforms to the Saturniades type, it becomes a matter of comparative less importance whether we confer upon the Citheronians family rank. Under this general view of the position of *Citheronia*, we consider the slighter correspondences in venation with the Hawk Moths to stand in relation to the narrowing of the wings and the habit of pupating in the ground to have been separately acquired. The Citheronians have pursued a peculiar path in evolution and one that stands in relation with their comparatively limited geographical distribution. They seem confined, as long ago pointed by me, to America, east of the rocky backbone of the two continents.

From the clear exposition of Dyar, Can. Ent., 28, 303, it seems impossible to reconcile a phylogeny based on the larval tubercles of the Saturniades with the one proposed by me on the neururation. Taking the latter as the final appeal we are obliged to suppose, that *Attacus* and *Saturnia* on the one hand and *Aglia* on the other have independently acquired the tubercles on anal plate. According to the value placed by Dyar on these organs, I must agree that this seems impossible. On the other hand, I cannot find it probable, indeed, it scarcely seems to me possible, that *Aglia* (which, in the same wing pattern of venation, clearly represents a more specialized type than *Automeris*) should belong to the Saturnian branch and wing pattern, as a generalized type. Nor does it seem to me within the range of probability, that *Automeris* or *Citheronia* could have produced the wing pattern of *Hemileuca*. On our respective trees, the groups represented by *Hemileuca* and *Aglia* change places. The female antennæ of *Aglia*, *Automeris* and *Citheronia* are of one type, so far as I can see; also those of *Attacus*, *Saturnia* and *Hemileuca* hold together, both types appearing distinctive. *Hemileuca* is just what one would expect of a generalized Saturnian; *Aglia*, just what one could agree that a specialized Automerid might

be. Vein VIII on secondaries has been retained by the two "lowest" groups on the respective branches, *Hemileuca* and *Citheronia*, exactly as appears most natural, in my tree, whereas in Dyar's *Hemileuca* goes to the top. The association of *Hemileuca* and *Automeris* as equivalent groups by Dyar seems, from this point of view, impossible. The whole wing pattern of the Agliid branch on my tree holds together, with *Citheronia* as its slightly dissenting feature, while the whole wing pattern of my Saturnian branch holds together without any discordant element whatever, unless the presence of VIII in *Hemileuca* is one, but this does not prevent Dyar placing it with *Automeris*. So that it is possible, from the neurulation, to admit of three "families:" Saturniadæ, Agliadæ, Citheroniadæ. Further than this we cannot go, and the matter must be left for more light. If *Aglia* belongs to the Saturnian branch and *Hemileuca* to the Automerid, then Dyar is correct, if not, then I am justified.

The strength of Dyar's argument and his system in general lies in the indifferent nature of the position of the tubercles. Where such ornaments or their details can be proven to be useful to the organism, adaptive, they are clearly secondary and their importance fails. I cannot judge of the value of the tubercle on the anal plate, but must take Dyar's word for it that it is primary. So we are at a deadlock. The pattern of the wing venation, not the position of the movable veins, is for me primary. In this case *Hemileuca* displays the Saturnian pattern. The presence of vein VIII on secondaries is subordinate in value to this. *Hemileuca*, from the pattern of neurulation, can not, by any reasonable process, have either been derived from *Automeris*, or alongside of it, or represent its ancestor—the rôle Dyar expects to fill, since it is less specialized. Its capabilities are exceeded by one and all of these demands. *Automeris*, on the other hand, may very well have thrown off *Aglia*, indeed I believe that *Aglia* sprang from Automerid-like forms. I can also clearly see, that *Saturnia* must have sprung from Hemileucid-like forms. } So different are *Saturnia* and *Aglia* they are with difficulty compared. *Citheronia*, while at the bottom, showing the Castnia-like pattern of *Aglia* and *Automeris*, presents a modification in the movement of vein IV₁, analogous to the Sphingidæ, Pierids and *Nemeobius*. *Attacus* and *Saturnia* show the Nymphalid movement of the meridian branches, but add to it the Pierid and Lycænid specialization of the radial branches. *Rothschildia iacobææ* has the most specialized neurulation of any lepidopteron known to me. On another line, the common White butterfly competes with it.

Not only does *Rothschildia* carry the Nymphalid and Lycænid secondary movement of the veins to an extreme, but it shows also the subprimary Papilionid specialization of the hindwings, the inner margin hollowed out, and VIII vanished, characters evinced by the Attacinæ. No better proof can be offered to sustain the thesis, that rank is a relative conception and that corresponding specializations are worked out upon different phylogenetic lines. And we see that it is inevitable, that systematists like Mr. Scudder, who erect an imaginary sequence upon the fastening of the chrysalis, or other congruous class of facts, and finding some example, like *Oeneis*, which meets their fancied requirements, proceed to place this "at the head" of the lepidoptera, must be doomed to disappointment.

The arrangement for the new check list may be provisionally laid down here, so far as embraced, by the two parts of my revision now published. I may say, that, so far as my preliminary studies are concerned, I believe to recognize eight superfamilies in the Lepidoptera: Papilionides, Hesperiades, Sphingides, Saturniades, Bombycides (Agrotides), Tineides, Micropterygides and Hepialides. I would keep as near as may be to the Linnean sequence, transferring the Sesiadæ and Anthroceridæ from the Sphingides to the Tineides; and the Cossidæ, Apodidæ, Ptychopsychidæ and Psychidæ from the Bombyces to the Tineides.

To sum up: In *Hemileuca*, as in *Saturnia*, veins IV₁ and IV₂ are furcate at the extremity of a long stem. This stem is morphologically the extension of that piece of the cross-vein lying between IV₁ and the Radius. Vein IV₁ is thus prevented absolutely from ascending the Radius, as it can in *Aglia* and *Automeris*, where no such extension takes place or offers to take place, and does in *Citheronia*. The neurulation here demands, in a positive manner, the classification advanced by me. No looking at the neurulation "broadly," no trifling as to terms or the theoretical value of certain changes in the movable veins, can ever obscure this point, which proves that *Aglia* can never be brought into a connection, either as a derived or original representative form, with the typical Saturnians. The dichotomy proposed by me is borne out by all exotic Saturnians I have been able to study. On the other hand, the reference of *Endromis* to the Sphingides is not positively demanded by the neurulation; a shorter vein, connecting II and III, and bending down II, near base of hindwings is present in *Bombyx mori*. From uncompleted studies in the Lachneidæ, this may not be homologous. The union is at most not contradicted strongly. It becomes

somewhat probable by the extension of the movable pupa from the web, a character not found in the Bombycides (Agrotides).

A. PAPILIONIDES.

Fam.	I.	PARNASSIIDÆ.	Type.	<i>P. apollo.</i>
"	II.	PAPILIONIDÆ.	"	<i>P. machaon.</i>

B. HESPERIADES.

Fam.	III.	PIERIDÆ.	Type.	<i>P. rapæ.</i>
"	IV.	NYMPHALIDÆ.	"	<i>N. lucilla.</i>
"	V.	AGAPETIDÆ.	"	<i>A. galathea.</i>
"	VI.	LIMNADIDÆ.	"	<i>L. chrysippus.</i>
"	VII.	LIBYTHEIDÆ.	"	<i>L. cellis.</i>
"	VIII.	NEMEOBIDÆ.	"	<i>N. lucina.</i>
"	IX.	RIODINIDÆ.	"	<i>R. lysippus.</i>
"	X.	LYCÆNIDÆ.	"	<i>L. endymion</i> (teste Scudder.)
"	XI.	MEGATHYRIDÆ.	"	<i>M. yuccæ.</i>
"	XII.	HESPERIADÆ.	"	<i>H. malvæ.</i>

C. SPHINGIDES.

Fam.	XIII.	ENDROMIDIDÆ.	Type.	<i>E. versicolor.</i>
"	XIV.	SPHINGIDÆ.	"	<i>S. ligustri.</i>

D. SATURNIADES.

Fam.	XV.	SATURNIADÆ.	Type.	<i>S. pavonia maior.</i>
"	XVI.	AGLIADÆ.	"	<i>A. tau.</i>
"	XVII.	CITHERONIADÆ.	"	<i>C. regalis.</i>

EXPLANATIONS OF PLATES II AND III.

The accompanying figures of the neurulation of Saturniades are obtained by photographic process and may thus be relied upon for exactness. The numbering of the veins is in accordance with the corrected Redtenbacher-Comstock system as applied to the Lepidoptera. III = Radial veins; IV = Median veins; V = Cubital veins.

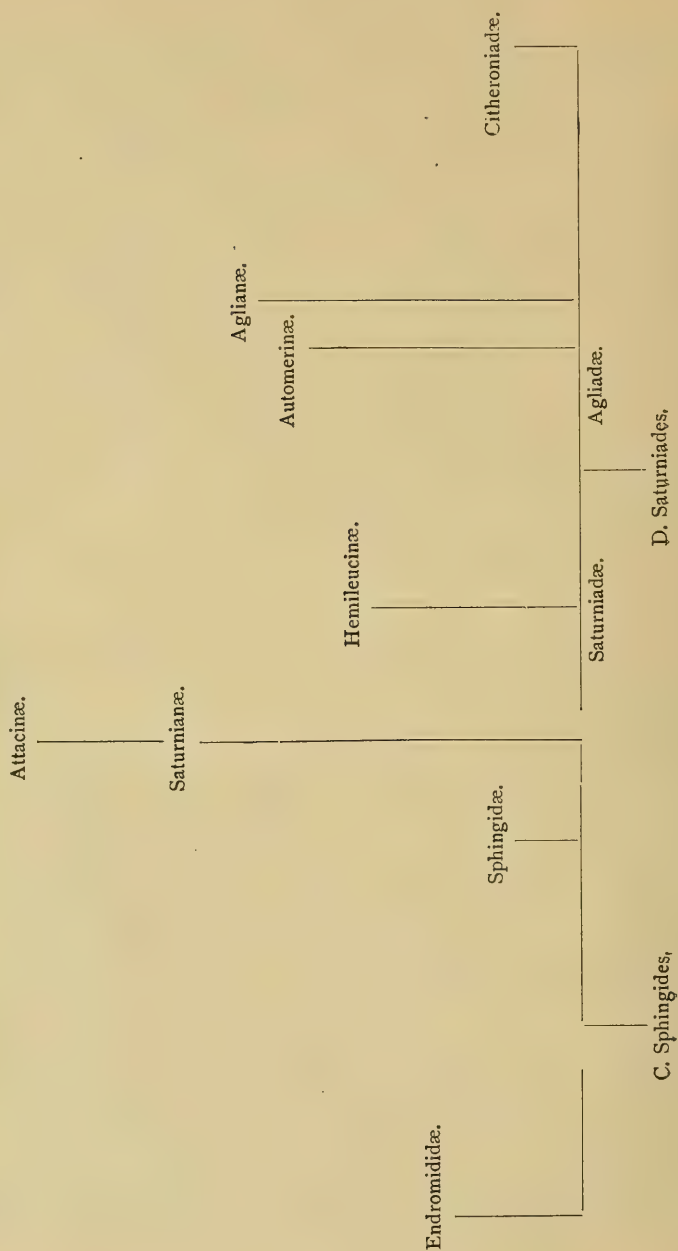
Fig. 1.—*Saturnia pavonia maior.* This and the succeeding represent the Saturnian type, in which IV₂ becomes continuous with IV₁. The crossvein appears to obtain merely between IV₂ and IV₁ the middle branch of the Media becomes Radial. In the Attacinæ, here not represented, the crossvein vanishes.

Fig. 2.—*Hemileuca maia.*—The same Saturnian type is exhibited with the secondary distinctions that vein III₁+2 springs from the Radius above the cell. In *Saturnia* it has travelled upwards to a point just before apex; by this character *Hemileuca* is more generalized. Also with the difference that vein VIII of hind wings, suppressed in *Attacus* and *Saturnia*, is here retained. Else it equals *Saturnia*.

Fig. 3.—*Aglia tau.* This and the succeeding figure represent the Aglian type of wing. Attention is called to the oblique outward direction of the still uneven portion of the crossvein between IV₂ and IV₁, the first indication of a secondary movement tending to the disintegration of the system of the Media.

Fig. 4.—*Automeris io.* The crossvein is transverse, and no indication of the secondary movement of the crossvein in *Aglia* is observed. The point of issue of III₁+2 is removed further towards the base of the wing. In these two points the Automerid wing lags behind, or is more generalized, than the typical Aglian wing. Else it equals *Aglia*.

PROPOSED GENEALOGICAL TREES OF THE HAWK AND EMPEROR MOTHS WITH REFERENCE CHIEFLY TO THE NEURATION.



NOTES ON THE DEVELOPMENT OF *DRASTERIA ERECHTEA* (Cramer).*

PLATES IV AND V.

BY F. M. WEBSTER.

The preparatory stages of this species have been studied by Professor French,[†] and I have no expectation of adding anything to his careful and painstaking work. Mr. M. V. Slingerland[‡] has also reared the species from the egg, but his studies relate more especially to the characters of the adults and those of closely allied species and varieties. My own studies were begun with the idea of watching the individual development of the young as closely as I was able, gleaning any points regarding such development as was possible, and which had not been already recorded. I can hardly claim that the work was premeditated, as, but for what might be termed a bit of carelessness, the study would have never been commenced.

September 24th, I captured a female moth and, killing her as was supposed, placed her on the setting board. On the following day it was found that she had revived and though unable to release herself, had struggled about and completely ruined herself so far as a desirable specimen was concerned (which I later had cause to regret), and, in the meanwhile, deposited a number of eggs. As she was captured among grass and clover, it was probably during the performance of that duty that she fell into my hands, and the labor was finished while pinned upon the setting board.

The eggs were of a malachite green, as described by Professor French, but I found them somewhat more flattened at the poles than he has described, though the drawings made from alcoholic specimens hardly represent them as they appear when freshly deposited, the flattening at the poles being closely illustrated by the appearance of the upper end in the middle of the three illustrations on Plate IV, the eggs from which drawing was made being those deposited by an unmated female.

The eggs were placed near a bunch of grass, transplanted to the vivarium, but they hatched while no one was about the insectary to ob-

*Read before Section "F," Zoology, of A.A.A.S., Detroit, Michigan, August 10 1897.

[†]*Papilio*, Vol. IV, pp. 148-149.

[‡]*Insect Life*, Vol. V, pp. 87-88.

serve them, and it was not until several days that the young were found on the blades of timothy. On October 10th, however, they were found, and at that time had precisely the appearance that French ascribes to the larvæ before first moult, viz., the two extremities of the body were of a pinkish color while the intermediate portion was of a greenish hue, which I ascribed at the time to the color of the food showing through the almost transparent walls of the body. In this case, I believe the egg stage was about twelve days, instead of five days, as observed by Professor French, as the eggs had not hatched on October 8th, and the larvæ did not show the reddish stripes, which indicate the period following first moult, on October 12th, but did show them on the 14th. This would give an egg period of twelve days, and the larval period to first moult five or six days, instead of three, as Professor French found it to be at Carbondale, Illinois. Was this difference due to latitude or to the advanced season when my observations were made? This will certainly be an interesting question. The very young larvæ have every appearance of belonging to the Geometridæ, and when feeding on the blades of grass, eat the substance of the blades only, leaving the veins and the epidermis almost intact. After the first moult they begin to eat through the leaves and along the edges, causing cleanly cut notches. The grass plant was now enclosed by a glass cylinder placed in a vertical position, and the larvæ, by jerking the posterior part of the body while hanging to the grass blades by the feet, threw the excreta away from them, and it could be observed in abundance on the inside of the glass, where it had been caught and held by the moisture collected there. If in any way disturbed, however, they hang by the penultimate and anal pairs of feet and wave the body about frantically, and then remain quiet, clinging by the three pairs of prolegs, the body arched nearly in the form of the letter S, the anterior feet and legs bent backward beneath the body, which is usually placed parallel with the blade on which it is stationed, but not holding to or touching it. On November 4th, some of the larvæ were observed in the act of moulting, the first time I had observed them to do so, though this was doubtless on account of my not having been able to give them daily attention. It will be observed that these larvæ were now a few days less than a month old. Professor French found the date of last moult to vary from 19 to 25 days from hatching.

My larvæ had now become reduced to six, and by the 19th of November, these varied so greatly in size that I was led to measure the lot, and by so doing found that there were really two series, in point of

size, each series comprising three individuals and measuring in length as follows: 1 inch ; $1\frac{1}{16}$ inches ; $1\frac{1}{8}$ inches, and $\frac{11}{16}$ inch ; $1\frac{3}{8}$ inch ; and $\frac{3}{4}$ inch. The larva measuring $\frac{11}{16}$ inch moulted on November 19th.

On account of being almost continually absent from home, I was now compelled to turn the larvæ over to my assistant, Mr. C. W. Mally, who gave them nearly all the attention they had throughout the remainder of the time that they were under observation.

After December 1, the larvæ appeared to increase in size very rapidly, the larger ones becoming lighter in color, and could hardly be distinguished from the yellowish and brown blades of grass, more or less eaten, and along which they would stretch themselves and remain for a long time, occasionally moving the head from side to side with a sort of trembling motion. This protective coloration had been observed from the time of the first moult of the larvæ, the brown stripes and greenish background blending with the discoloration of the part of the blades of grass that had been attacked, while the lighter green corresponded with the portions of uneaten epidermis, backed by the green color of the blades behind them. As the larvæ became more aged the colors changed to a more decided brown hue, intermingled with yellowish, and with this change there came a decided disposition to pass more of the time nearer the base of the grass plants, where these colors predominated, than higher up, where the prevailing color was a uniform green. Earlier in the life of the larvæ, the upper portion of the blades of grass were more generally attacked, none being cut off from below and falling down to turn to yellow and brown, while now at this later period, many blades were eaten only for a short distance above the ground and falling down took on the yellow and brown. Whatever might have caused this change of habit, it was certainly not on account of the lower portions of the blades being more tender and succulent, though with the continually increasing bulk of the individual larva there would naturally follow a greater aversion to activity, and a less disposition to climb to the higher portion of the blades of grass. It seems to me that we here have a most interesting case of adaptation, and one that was not anticipated when these observations began.

On December 3 the three larger larvæ began to show signs of uneasiness, crawling about the cages, and again stretched at full length on the side of the same, and again down among the grass, feeding.

December 7, one of the larger larva, which will be hereafter designated as No. 1, and the adult and chrysalis is shown under this number in the illustrations, settled down in a corner of the breeding cage, fas-

tened a few silky threads over itself, a labor which was completed the following day, and passed into the pupal stage, having passed a larval period of, approximately, sixty-one days, and seventy-four days from time of deposition of the egg.

The remaining two of the three larger larvæ crawled down to the bottom of the breeding cage and began constructing their cocoons, but died before pupating. The imago of larva No. 1, issued January 13, 1897, thus giving a pupal period of thirty-five days, and one hundred and nine days from date of oviposition.

Of the series of three smaller larvæ, after December 4, two of them increased in size very rapidly, and, in fact, seemed to be gaining upon those of the first series, while the third, which, so far as could be determined, had continued to be the smaller since the time of measurement on November 19, did not increase in size so rapidly. While the two just mentioned became slightly lighter in color, precisely as had the three larger ones, this one continued to be much smaller and darker in color, the blackish stripes being quite conspicuous.

The first larva of the three smaller ones to pupate will be designated as No. 2, the moth and cocoon being so numbered in the accompanying illustration. This was one of the two light colored larvæ of this series, and began fastening the blades of grass together on the night of December 8, the imago issuing January 19, 1897, after a pupal period of forty-one days, and one hundred and fifteen days from date of oviposition of the egg.

The third larva reared to the adult moth will be designated as No. 3, including adult and cocoon. This was second of the lighter colored of the second and smaller series, and began pupating during the night of December 9, but did not finish doing so until the following day, leaving the blades of grass which it had begun fastening together, with the evident intention of constructing a cocoon therefrom, and appropriated a bit of cotton that happened to be within reach, and constructed its cocoon from that, thus forsaking a natural material for an artificial, and seemingly one of more practical utility. The imago appeared January 23, 1897, after a pupal period of forty-four days, and one hundred and seven days from the deposition of the egg.

The third of this series and the smallest of the larvæ studied, escaped from its breeding cage, December 15, evidently when searching about for a satisfactory place in which to spin its cocoon. It continued to be of a darker color throughout, but had attained to the same size as its fellows. Later, an adult of this species was found dead in the insect-

tary, during the latter part of January, and as this was the only example found and the date of finding corresponds so nearly with that of the appearance of the remainder of the whole series, together with the fact that there was hardly a possibility of a larva having been unintentionally introduced from without, there is little doubt but that this was the imago from the larva which had escaped from its breeding cage. It was very similar to No. 1, being about the same size, but somewhat darker in color. The mother of the whole three being lighter and of the type of No. 2.

About October 10, 1896, Mr. Mally brought in from the fields three larvæ, seemingly nearly full grown, and these were placed on clover and blue grass in a breeding cage in the insectary. About October 22, all three of these formed cocoons similar to the one shown in No. 4, which is composed of three clover leaflets fastened together, while still attached to the petiole, thus making a neat and deceptive case, having three quite conspicuous angles. The weight of the pupa of course caused them to turn downward, but even then they appeared like a drooping, withered leaf, and for this reason very apt to be overlooked. One of these three pupæ was preserved for a cabinet specimen, the second died, while the third transformed December 6, and is shown with cocoon in No. 4.

Of two larvæ brought in from the fields and placed in jelly cups about October 21, one formed a very slight cocoon of silk as shown in No. 5, and the other fastened blades of grass together, as shown in No. 6, notwithstanding both were supplied with grass for food, and hence both had the same material from which to construct their cocoons. The imagos both appeared December 18, 1896.

The latitude of Wooster, Ohio, where these experiments were carried on, is $40^{\circ} 48'$, while that of Carbondale, Illinois, where Professor French studied the species, is about $37^{\circ} 45'$. It will be observed that with him the egg period was less than half as long as with me, while with him the species developed in from 41 to 66 days from the egg, the majority going from 48 to 53 days, with me this period varied from 107 to 115 days. The eggs which furnished the basis for his breedings were deposited August 13, and those which I followed were deposited on September 24 or 25.

I am quite certain that, here in northern Ohio, the insect goes into the winter in the larval stage, as I have observed nearly full grown larvæ crawling about after the middle of November, though hibernation may also occur with pupæ or even adults. In southern Ohio, I have observed seemingly freshly emerged adults early in April. All of my

larvæ upon which these studies are based were kept in the insectary, and in a temperature varying probably from 60° to 75° Fah.

The species is a grass as well as a clover insect, as will be observed from the foregoing, and as the striped body of the larvæ would indicate, but it would seem that the clover leaf is especially desirable as material for constructing the cocoon, and it is just possible that the lack of this building material would account for the great variation in tastes in selecting such as was at hand to supply the place of clover leaves, thus the better illustrating natural selection.

The variation in rapidity of growth I am totally unable to account for, as there was an abundance of food, and the larvæ were never crowded. With the individual variation in size and time required for development in the larvæ, as well as their difference in coloration, together with the equally striking difference in the appearance of the adult, it would seem that in this case at least individual variation offered no very narrow basis for the evolution of forms, which, under a favorable environment, might still further progress through varieties to species. That this may have actually transpired, is witnessed by the exceedingly close resemblance between *Drasteria erectea* Cram. and *D. crassiuscula* Haw., either one of which might have given origin to the other, through the same course of evolution as that, seemingly, being followed at present by varieties *agricola* G. & R., *ochrea* Grt., and *distincta* Neum., the two latter being considered by Mr. Slingerland as varieties of *D. crassiuscula*. It only requires that these varieties become sterile to each other and the parent stock when crossed, in order for them to become species, as valid as either of the two just mentioned.

EXPLANATION OF PLATES IV AND V.

Fig. 1. *Drasteria erectea* and cocoon.

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|------|--------------------------|---|---|---|
| " 2. | " | " | " | " |
| " 3. | " | " | " | " |
| " 4. | " | " | " | " |
| " 5. | " | " | " | " |
| " 6. | " | " | " | " |
| " 7. | Eggs, enlarged (pl. IV). | | | |
| " 8. | Larva, enlarged (pl. V). | | | |

NEW AMERICAN MOTHS AND SYNONYMICAL NOTES.

BY HARRISON G. DYAR, PH.D.

LITHOSIIDÆ.

Hypoprepia mexicana Druce.1885. *Lithosia mexicana* DRUCE, Biol. Cent. Am. Lep. I, 131, pl. 13 ff 2, 3.1892. *Crambidia mexicana* KIRBY, Cat. Lep. Het. I, 338.

Dark mouse gray, a narrow yellow line on costa, through middle of cell to margin and along the internal margin, just a trace on the outer half of submedian fold. Secondaries all gray. Sides and posterior part of thorax and tip of abdomen pink.

Two specimens, Chiricahua Mts., Arizona (H. G. Hubbard). Coll. U. S. Nat. Mus.

More heavily shaded with gray than in the specimen figured by Druce, but doubtless conspecific.

Bruceia hubbardi, sp. nov.

Similar to *B. pulverina* Neum., but smaller. The colors are the same in both species but the diffuse dark powderings of fore wings are differently shaped. In *hubbardi* there is a series of terminal dots, absent in *pulverina*, and there is a distinct angular line resting on anal angle where in *pulverina* there is only a diffuse powdering. Expanse, 22-25 mm.

1 ♂, 2 ♀ ♀ Chiricahua Mts., Arizona (H. G. Hubbard), July 4. Type no. 3840, U. S. Nat. Mus.

Crambidia lithosioides, sp. nov.

Dark slate gray, secondaries lighter at base. A very narrow pale yellow line along costa almost to apex, along anterior edge of collar, broken centrally, and on posterior orbits faintly; otherwise immaculate. Expanse, 21 mm.

One ♀, Texas. (Belfrage.) Type No. 3784, U. S. Nat. Mus.

Resembles *Lithosia bicolor*.

Crambidia uniformis, sp. nov.

Dark slate gray, all the veins of primaries finely lined in dull-ocherous; secondaries and abdomen a shade paler gray. Expanse, 19 mm.

One ♀, Washington, D. C. (F. C. Pratt). Type No. 3790, U. S. Nat. Mus.

Size and appearance of *C. lithosioides*, but without the ocherous costa.

Palpidia, gen. nov.

Primaries 12-veined, median 4-branched, veins 3 and 4 on a short stalk, 7 to 9 stalked, 10 from the apex of the cell; 11 from sub-costal. Secondaries 8-veined,

median 3-branched, 3 and 4 stalked, 5 from the cross-vein, weak, 6 and 7 from the apex of the cell, 8 joined to subcostal for one-third of the length of the cell. Frenulum divided (♀).

Eyes large, no ocelli; antennæ simple (♀), palpi long, obliquely ascending twice as long as the head and rising above the vertex, second joint long, closely scaled, third distinct, small. Body slender, legs with long spurs, two pair on the hind tibiae; wings long, narrow, the costa nearly straight but depressed at apical third, outer margin straight, curved at anal angle; secondaries considerably shorter than primaries.

In the synoptic table falls with *Tantura* Kirb., but this genus possesses ocelli and must be removed to the Noctuidæ (see later in this article).

***Palpudia pallidior*, sp. nov.**

Pale ochereous, veins pale ochereous, all the interspaces thickly irrorate with black scales. Secondaries whitish.

One ♀. Cocoon Grove, Florida (E. A. Schwarz). Type No. 3783, U. S. Nat. Mus.

Resembles *Crambidia pallida* Pack.

EUCHROMIIDÆ.

***Lycomorpha* Harris.**

The account of this genus by Neumoegen and Dyar (Journ. N. Y. Ent. Soc., I, 102) contains two important errors. We did not observe that vein 8 was present on the hind wings of *coccinea* Hy. Edw., having only examined the type without removing it from the drawer, and hence wrongly allowed it to remain in *Lycomorpha*. We mistook for *L. fulgens* Edw. the specimens which stand in the Edwards collection as *Ptychoglene æqualis* and described these. It will be noticed that our description contradicts Edwards' original one (Papilio I, 116). These specimens bear a label, I think, in Mr. Schaus' handwriting, but they do not belong to *Ptychoglene*, as vein 8 of secondaries is absent; moreover they do not fit Walker's description of *P. æqualis*, as the costal edge is not black and the thorax is red instead of black. I propose to call them *Lycomorpha schausi*.

***Lycomorpha pulchra*, sp. nov.**

Head and body black; thorax above, including collar and patagia, red. Wings bright red, the fringes of both narrowly black and a very narrow black line on the outer fourth of costa and internal margin of primaries. Expanse, 25 mm.

1 ♂, Texas (Belfrage). Type No. 3786, U. S. Nat. Mus.

Of the species described as *Lycomorpha sinuata* and *coccinea* Hy. Edw. belong to *Ptychoglene* (Arctiidæ); *mexicana* Druce, *constans*,

rata, *latercula* and *fusca* Hy. Edw. to *Triplocris*; *marginata*, *notha* Hy. Edw. and *centralis* Walk. to *Pyromorpha* (Pyromorphidæ); *augusta* Hy. Edw. is a *Euchromian*, but it does not belong to *Lycomorpha* as vein 10 is stalked on fore wings and 5 is present on hind wings. It may form a new genus when this family is revised, or may come in some genus at present unknown to me. It falls into *Ctenucha* in the synopsis. From the description I think *regia* Schaus must go with it. Of the other species I have seen but half, and they may not all be congeneric. Judging from the above, they may belong anywhere in five genera of three families, representing two super-families. But, assuming them to be congeneric, they separate as follows. Those which I have reason to believe correctly placed generically are preceded by an asterisk. Species not placed, *chlora* Schauf.

Synopsis of *Lycomorpha*.

1. Thorax all black..... 2
 Thorax black; patagia red or yellow..... 3
 Thorax all red..... 8
2. Secondaries dull orange, with narrow black margin..... *teos* Schaus.
 Secondaries with a broad black margin..... *viridiceps* Feld & Rog.
3. Primaries with black reaching from outer margin to near middle of wing.... 4
 Black border of primaries covering about one-third of wing..... 6
 Black border confined to the fringe..... 7
4. Outer black in the form of a border..... 5
 Outer black a longitudinal band..... **fumata* Möschl.
5. Primaries orange at base..... **pholus* Dru.
 Primaries red at base..... **miniata* Pack.
6. Secondaries black almost to costal margin..... *contermina* Hy. Edw.
 Secondaries black on outer half..... *desertus* ♂ Hy. Edw.
7. Red; secondaries nearly all black..... **fulgens* Hy. Edw.
 Orange; secondaries with fringe only black..... *anacreon* Druce.
8. Primaries red, with rather broad outer black border..... **schausi* Dyar.
 Primaries red, with black fringe..... 9
 Primaries orange, with two transverse black bands... *desertus* ♀ Hy. Edw.
9. Secondaries with outer black border covering half or more of wing... **grotei* Pack.
 Secondaries with only the fringe black..... **pulchra* Dyar.

ARCTIIDÆ.

In my revision of genera (Can. Ent. XXIX, 212), I included two with "vein 8 of secondaries wanting." This is not strictly the case in the sense that vein 8 is wanting in the *Euchromiidæ* by coalescence with 7, for in the series culminating in *Eupseudosoma* and *Eucereon* it has disappeared by atrophy, apparently, while in *Bertholdia* it is vein 6

that has disappeared by coalescence with 7. In some species of this group vein 8 coalesces with 7 to end of cell, producing the appearance of the absence of vein 8. These two groups of Phægopterids are thus essentially Arctian, though apparently showing the Euchromian structure.

Bertholdia was erected by Mr. Schaus in this Journal (IV, 137) with type *specularis* H. S., containing three species. These are superficially recognizable by the large triangular vitreous patch on costa, but other species without this mark must ultimately come in the genus. Mr. Schaus has kindly given me a number of specimens of *Bertholdia*, among which I recognize a new form, apparently uncharacterized.

***Bertholdia schausiana*, sp. nov.**

Intermediate between *specularis* and *trigona*. Primaries lead color, shaded with pink more or less, especially toward anal angle, dotted with black. Costa red, except at the vitreous patch, where it is yellow. The patch is excavated superiorly between vein 6 and costa, produced outward in the interspace 5-6 or simply angled, the lower border nearly straight, lightly shaded with yellow, the veins black dotted. The shape is most like *trigona* but distinctly angled in the interspace 5-6 and not pointed below. Basal yellow spots absent, or one small one present. Body and hind wings as in *trigona*. Expanse, 33-39 mm.

1 ♂, 3 ♀ from Mr. Schaus without locality. (Coll. Dyar.)

Synopsis of Species.

(Group 1 with large vitreous patch.)

1. Secondaries vitreous with gray outer border ***specularis* H. S.**
 Secondaries white, without gray border..... 2
2. Primaries with white subterminal line..... ***albipunctata* Schaus.**
 Primaries without this line..... 3
3. Subapical patch rounded below, scarcely crossing vein 4; basal spots reduced
 ***schausiana* Dyar.**
 Subapical patch pointed below to vein 3, or further expanding downward; basal
 spots usually expanded ***trigona* Grote.**

***Gorgonidia*, gen. nov.**

Primaries with median vein 4 branched, cross vein of cell slightly concave, 6 from the apex of cell, 7-10 stalked; secondaries with vein 5 absent, 6 and 7 stalked, 8 joining the subcostal for over half the length of the cell. Wing long, produced, the secondaries small, trigonate. Palpi robust, not reaching vertex of head, first and second joints subequal, third minute. Ocelli touching the eye. Male antennæ serrate ciliate. Two pair of spurs on hind tibiae.

The male has a stridulating organ on the thorax like that of the Asiatic genus *Dionychopus*, *i. e.*, *Spilosoma* (?) *nivens* Ménét. of Kirby's catalogue. (See Psyche, VII, 415, for description.)

Gorgonidia mirabilior, sp. nov.

Primaries vermilion red, crossed from the costal margin nearly to the middle by three yellow bands, narrowing inferiorly and edged with black except below; an elongated slate colored patch beyond the cell reaching the margin, sharply truncate basally, its lower inner angle produced to join a large rounded similarly colored patch which rests on the anal angle separated from the edge by a narrow red line and reaching above to vein 2 and basally to near the middle of the wing. Secondaries pinkish red, vermilion on costa and internal margin. Body vermilion, ochereous tinted on head and front of thorax; posterior edge of collar pink in the middle. Posterior edges of abdominal segments below narrowly white. Femora, tibiae and tarsi black, lined and powdered with white.

1 ♂, Piches & Perene Vs., 2,000–3,000 feet, Peru. (Soc. Geog. de Lima.) Type No. 3791, U. S. Nat. Mus.

Closely allied to *Zatrephes buckleyi* Druce from Ecuador, and *Z. garleppi* Druce from Bolivia, which will also come in this genus.

Trichromia neretina, sp. nov.

Head dark ochre yellow on vertex, front purplish brown. Thorax purple brown; abdomen bright red dorsally, pale yellow below; legs pale yellow, fore femora bright red in front, tibiae and tarsi outwardly ochereous. Fore wings purplish brown, a yellow band from middle of costa to middle of outer margin, very narrow and dislocated (at vein 4) centrally, wide on the margins and running very narrowly along costa, more widely along outer margin to apex, cutting off the apical portion of the ground color into a rounded spot. The ground color is darkened where it joins the yellow. Secondaries straw yellow, tinted with ochre on the margins. Below as above, but the dark marks fainter, the basal patch pale and diluted with pink, the apical one more uniformly slaty. Expanse, 27 mm.

1 ♂, Piches & Perene Vs., Peru, 2,000–3,000 feet. (Soc. Geog. de Lima.) Type No. 3792, U. S. Nat. Mus.

Very similar to *Neritos repanda* Walk., but entirely without the sex mark.

Trichromia and *Neritos* may probably be separated by the sex mark, if not otherwise; but at present the species are mixed and I list them together below. Six of the species listed by Kirby seem not congeneric. I have not examined specimens, but think that *amastris* and *asana* Druce, as well as *cutheans* Druce (described since the catalogue) will fall near, if not in *Bertholdia* Schaus.

Synopsis of the similar species of Trichromia and Neritos.

- | | |
|-------------------------------------------------------|-------------------------|
| 1. Secondaries dark brown..... | 2 |
| Secondaries pale yellow or pink..... | 4 |
| 2. Yellow band of primaries broken in the middle..... | onytes Cr. |
| Yellow band crossing the wing..... | 3 |
| 3. Abdomen dark, head red..... | psamas Cr. |
| Abdomen red above, head yellow..... | sithnides Druce. |

4. Yellow band of primaries crossing the wing..... 5
Yellow band broken in the middle..... 9
5. Abdomen red or pink above..... 6
Abdomen yellow. 8
6. Head yellow, secondaries pink..... **patara** Druce.
Head ocherous on vertex only ; secondaries yellow..... 7
Head reddish brown, secondaries yellow..... **samos** Druce.
7. Male with elliptical sex mark near base of fore wing..... **repanda** Wlk.
Male without a sex mark..... **neretina** Dyar.
8. Head yellow..... **tipolis** Druce.
Head gray..... **pandera** Schaus.
9. Costal spot yellow..... **flavoreseus** Walk.
Costal spot broadly centered with brown... .. **cotes** Druce.

Trichromia is not a Lithosian, as placed in Kirby's catalogue, as ocelli are present. The neuration of the species here described is as follows :

Primaries with 4-branched median, cross-vein of cell strongly angulated, forming a right angle, 6 from the apex, 7-10 stalked, 10 given off before 7, 11 close to apex of cell, 12 from base. Secondaries with two internal veins, median 3-branched, veins 3 and 4 on a long stalk, 5 absent, cross vein angled, 6 and 7 on a long stalk, 8 joining the subcostal for only about one-third of the cell, curving and rather remote from 7, strong. Tibial spurs normal, small. The ocellus is pale, situated in a black ring which is about as wide as the diameter of the ocellus itself and does not touch the eye.

Pygarctia muricolor, sp. nov.

Fore wing mouse gray with a slight bronzy reflection, translucent except along the margins and apically ; hind wing translucent grayish, darker along the outer margin, pale at the anal angle. Head dark gray in front, vertex ochre yellow ; collar mouse gray, narrowly edged with ochre behind ; thorax gray, the edges of the pata-gia a shade lighter ; below ocherous, including coxæ ; legs gray. Abdomen buff, a dorsal row of small dots and a rather broad lateral band mouse gray. Expanse, 41 mm.

1 ♂, Chiricahua Mts., Arizona (H. G. Hubbard). Type No. 3787, U. S. Nat. Mus.

To give a wider comparison with southern forms this species may be provisionally placed in the genus *Opharus* Walk. on superficial resemblance. The following are its structural characters :

Accessory cell present, veins 7-10 from its apex, 8 and 9 stalked ; 8 of secondaries joining cell for half its length, faint at the tip ; no veins absent. Palpi oblique, por-rect, not reaching the vertex, first and second joints subequal, third half of the second ; tibial spurs normal, short. Body slender ; antennæ long ; hind wings rather large.

Assuming the described species of *Opharus* to be congeneric, they would separate as follows :

1. Abdomen continuously marked with orange or yellow, not transversely banded, 2
 Abdomen not continuously orange, transversely banded or spotted with pale, 6
 Abdominal without marks, dark. 11
2. Abdomen dark dorsally. **basalis** Walk.
 Abdomen ocherous dorsally. 3
2. Abdomen with lateral spots. 4
 Abdomen with a lateral band. 5
4. Secondaries unicolorous, translucent at base. **euchætiformis** Hy. Edw.
 Secondaries ocherous on basal half. **ruficollis** Druce.
5. Abdomen blackish below. **gemma** Schaus.
 Abdomen ocherous below. **muricolor** Dyar.
- 6 Abdomen yellow or red, transversely black banded 7
 Abdomen dark brown, spotted with testaceous or white. 9
7. Secondaries brownish. 8
 Secondaries pink on internal margin. **rhodosoma** Butl.
8. Large, two yellow dots on head. **gigas** Dogn.
 Smaller, thorax with small blue dots. **albipunctatus** Druce.
9. Abdomen with testaceous spots on the sides. **procrioides** Walk.
 Abdomen banded with yellowish and with white spots. **mundator** Druce.
 Abdomen with white spots only. 10
10. Two lateral rows of white spots on abdomen. **tristis** Schaus.
 One such lateral row. **dolens** Druce.
11. Primaries brown. **carbonarius** Dogn.
 Primaries gray. 12
12. A darker shade crossing the cell. **morosus** Schaus.
 Primaries uniform dark gray. **lugubris** Schaus.

Ptychoglène flammans, sp. nov.

Deep bluish black. Fore wings bright scarlet, the outer margin broadly black, broadest at anal angle and twice inwardly waved, namely at submedian and discal folds; inner margin narrowly lined with black. Costal edge of secondaries broadly red on basal two-thirds. Below as above, the outer border of primaries straighter within. Expanse, 31 mm.

2 ♂♂. Chiricahua Mts., Arizona (H. G. Hubbard). Type No. 3785, U. S. Nat. Mus.

Apparently allied to *phrada* Druce, but the border of primaries is irregular.

Ptychoglène has the venation of *Eubaphe*, but differs in the longer narrower fore wings. In this genus will also come *coccinea* Hy. Edw. as North American.

Of the described species, *pomponia* Druce is *Eubaphe ostenta* Hy. Edw.; *splendida* Druce is green and can hardly belong to this genus. The others separate as follows. I have marked with an asterisk those examined by me.

1. Thorax, including patagia, black 2
 Patagia red or orange, at least at base 6
 Thorax, including patagia, red **coccinea* Hy. Edw.
2. Primaries black along costal edge 3
 Primaries red along costal edge 5
3. Secondaries black except along costa 4
 Secondaries red with black border **sanguineola* Bdv.
4. Costal edging of primaries broad **erythrophora* Feld.
 Costal edging of primaries narrow *æqualis* Walk.
5. Outer border even *phrada* Druce.
 Outer border twice dentate **flammans* Dyar.
 Outer border sinuately widened below **sinuata* Hy. Edw.
6. Costal margin of primaries red 7
 Costal margin black at base *ira* Druce.
7. Secondaries black or mostly so 8
 Secondaries orange on basal half *pamphyllia* Druce.
8. Primaries black except red costal line *rubromarginata* Druce.
 Costal half of wing red *xylophila* Druce.
 Primaries red, outer margin broadly black *pertunda* Druce.

NYCTEOLIDÆ.

Arctiidae, *Nycteolina*, HAMPSON, Moths of India II, 128.

Noctuidæ, *Sarrothripinæ*, HAMPSON, Moths of India II, 365.

Cymbidæ, KIRBY, Cat. Lep. Het. I, 279.

Nycteolidae, SMITH, List. Lep. 23.

Pseudoipsidæ, GROTE, Syst. Lep. Hild.

Nycteola, HUBNER, Tentamen.

Pseudoipes, HUBNER, Tentamen.

I see no sufficient distinction between Hampson's *Nycteolina* and *Sarrothripinæ*. The primary distinction founded on vein 8 of secondaries is negated by some of his *Sarrothripinæ*, and the structure of the groups seems otherwise the same. The males have the bar-shaped retinaculum in both. The green and gray moths differ superficially, but the larvæ and cocoons are the same and are not Arctian. They are excluded from the Lithosians by the presence of ocelli. Family type *Nycteola revayana* Scop.

Nycteola proteella, Walsh.

1864, WALSH, Proc. Ent. Soc. Phil. III, 609, note (as Tortricid).

1867, WALSH, Proc. Ent. Soc. Phil. VI, 272, note.

Similar to *revayana*, but smaller and without the prominent angles at base of costa of fore wings. Gray, shaded with brown. Basal line curved, t.a. line straight, black, narrow; t.p. line wavy, strongly arcuate outward opposite cell; s.t. line undulate, shaded. The wing is nearly uniformly grayish with the lines faint, or heavily shaded with blackish and brown between the lines and more distinctly marked; very variable. Expanse, 14-17 mm.

Three examples from Walsh collection, U. S. Nat. Mus.

NOCTUIDÆ.

Cydosia Westwood.

New synonyms of this genus are *Penthetria* Hy. Edw. and *Tantura* Kirby. *C. majuscula*, the type of the genus, belongs to *Cydosia*. Neumoegen and Dyar placed it in the Lithosiidæ, but ocelli are distinctly present, as I have proved in fresh material. We could not examine the type freely, so failed to discover them.

The other species of *Penthetria*, namely *parvula*, from Florida, is a Tineid forming a curious pedunculate, lace-work cocoon. It is at present without reference to any genus.

Synopsis of forms of Cydosia.

Primaries with three golden brown bands.

Many white spots on wing and thorax *nobilitella* Cr.

Without white spots. *aurivitta* G. R.

Primaries without any markings. *majuscula* Hy. Edw.

Euclidia diagonalis, sp. nov.

Pattern of markings as in *E. intercalcaris* Grt., but the pale mark that arises near the anal angle is directed to the outer third of the cell instead of joining the pale reniform as in the allied species. Other markings similar but rather more drawn out longitudinally. A black streak runs through the cell, obscuring the punctiform orbicular. The white t. p. line is rather diffuse and shaded, straight, joining the oblique mark below. Expanse, 44 mm.

One ♀, Mesino Valley, New Mexico (Wheeler Survey, through A. S. Packard). Type No. 3844, U. S. Nat. Mus.

Apatela minella, sp. nov.

Closely allied to *A. fragilis* Guen. but uniformly shaded with dark gray. Head, thorax and fore wings blackish gray, the lines as in *fragilis*, the centers of t. a. and t. p. lines whitish and rather contrasting. Ordinary marks outlined in black, the basal dash indicated. Abdomen dark gray; secondaries scarcely darker than in *fragilis*.

One ♀. Type No. 3843, U. S. Nat. Mus.

The specimen is without locality label, but probably from Rocky Mountain region.

This may be a western form of *fragilis*.

NOLIDÆ.

Following Dr. Chapman's views on the phylogeny of this group, I place them as a distinct family at the bottom of the Bombyces or between the Bombyces and Tineides. The larval characters correspond with this

position. Hampson makes them a subfamily of Arctiidae and Meyrick includes them in the Arctiidae, with which no fault is to be found if their different origin be kept in mind.

The following is a revision of our species, following Meyrick for genera.

Synopsis of Genera.

Primaries 10-veined, ♂ antennæ ciliate	Roeselia
Primaries 11-veined, ♂ antennæ slenderly pectinate	Nola
Primaries 12-veined	Meganola

Roeselia Hübn.

Argyrophyes Grt. falls as a synonym on Meyrick's definition; also *Lebena* Walk.

Synopsis of Species.

1. Primaries gray 2
 Primaries in part white 3
2. Three costal dots, on basal, t. a. and median lines **triquetrana** Fitch.
 Two costal dots, on basal and t. a. lines **minna** Butl.
3. Wing shaded, grayish on costa and anal angle **sorghiella** Riley.
 Wing with marks contrasted, in part black 4
4. Basal white space cut off from costa **menalopa** Zell.
 Basal white space reaching costa, at least narrowly 5
5. Median band broad **pustulata** Walk.
 Median band defined only on outer half **cilicoides** Grt.

The type of *Nolaphana triquetrana* Fitch is in the Nat. Museum, and is *trinotata* Walk. = *sexmaculata* Grt. *Nola hyemalis* Stretch = *N. minna* Butl.

Nola Leach.

Synopsis of Species.

1. T.p. line outwardly arcuate opposite cell 2
 T.p. line nearly straight, not bent 4
2. Wing lines usually heavy as compared with costal spots 3
 Wing lines slight, costal spots heavy **phylla** Dyar.
3. Larger, markings blurred on a dark ashen ground **fuscula** Grt.
 Medium, markings somewhat contrasted on a whitish ground **minuscula** Zell.
 Smaller, the markings usually slender, the ground more ashen **ovilla** Grt.
4. Basal dash on primaries less distinct than outer costal dot **involuta** Dyar.
 Basal dash strong **exposita** Dyar.

Nola involuta, sp. nov.

|| *N. minuscula* Dyar, Psyche, VI, 248 (1892).

Fore wing dusky gray; t. a., t. p. and s. t. lines oblique, parallel, fine, finely dentate or dotted, nearly straight, the s.-t. faintest, but waved and bordered outwardly by a pale shade. On costa at base a brown dash; a brown tuft of scales on

t. a. line below costa, surrounded more or less by a diffuse cloud. Hind wing whitish, gray on the margin. Expanse, 18 mm.

Two ♂ ♂, Los Angeles, Cal. (Koebele, Coquillett), ♀ Santa Barbara, Cal. (Dyar). Type No. 3779, U. S. Nat. Mus.

Nola exposita, sp. nov.

|| *N. hyemalis* Dyar, Psyche VI, 110 (1891).

Fore wing pale gray, thinly scaled; t. a., t. p. and s. t. lines oblique, parallel, fine, finely dentate, nearly straight; lines obscure, especially the s. t. On costa at base a brown dash; a brown tuft of scales on t. a. line below costa; a slight brown shade between t. a. and t. p. lines, especially on internal margin. Secondaries whitish, translucent. Expanse, 16 mm.

One ♂ Phoenix, Arizona (Dyar). Type No. 3780, U. S. Nat. Mus.
Close to *involuta*, but the larval habit is different.

Nola phylla, sp. nov.

Thorax and primaries bright silver gray. Lines as in *minuscula*, but very slender, minutely dentate. Three raised whitish dots in the cell, above which two distinct brown-black marks on costa, one at base, the other at end of cell. Secondaries and abdomen dark gray. Expanse, 17 mm.

Two ♀ ♀, Long Island, N. Y. (Dyar), Washington, D. C. (Koebele); also several other specimens. Type No. 3781, U. S. Nat. Mus.

The larva lives on the oak, but is different from *ovilla* and has different habits.

Meganola, gen. nov.

Primaries 12-veined, median 4-handed, 7-10 stalked, 7 given off before 10. Secondaries 7-veined, median 2-branched, vein 4 absent, 5 given off a little below middle of cross vein, 6-7 stalked, 8 joining subcostal for about one-third the length of cell. Hind tibiae with two pairs of spurs, legs long, slender. Palpi about three times as long as head, broad, flattened, thickly scaled, obliquely descending. No ocelli. Primaries with three raised tufts of scales.

Meganola conspicua, sp. nov.

Thorax and fore wings dark gray. T. a. line just visible, arcuate, dentate; t. p. line rather distinct, blackish, bent inward below median vein and obsolete on costa, finely blunt-dentate, free or closely paralleled inwardly by the median line which, when present, is irregularly dentate and bent towards base on costa; subterminal line obscure, inwardly waved, faintly bordered with whitish outwardly. A row of fine terminal white points with black scales inwardly. On costa at base a brown dash and a few brown scales also on the raised patches in middle and at end of cell. Secondaries grayish, pale at base. Expanse, 26 mm.

Three ♀ ♀, Texas; Colorado; Fort Grant, Arizona (H. G. Hubbard). Type No. 3789, U. S. Nat. Mus.

LACOSOMIDÆ.

Lacosoma arizonicum, sp. nov.

♂ fore wing slightly incised at anal angle and roundedly produced at vein 3, the apex rounded, not falcate; hind wing rounded, somewhat sharply angled at anal angle, and slightly excised between the veins. Body flesh color, shaded with rosy pink on head and pectus; antennæ yellowish with long pectinations. Wings pale brown, the basal half shaded with rosy pink, sparsely irrorate with brown. An obscure discal dot on both wings, black, overlaid with white, and a narrow, very slightly flexuous outer common brown line. Expanse, 29 mm.

One ♂. Chiricahua Mts., Arizona (H. G. Hubbard). Type No. 3789, U. S. Nat. Mus.

PYROMORPHIDÆ.

Acoloithus rectarius, sp. nov.

Entirely black, the collar concolorous. Fore wings slightly bluish, hind wings greenish. Expanse, 13 mm.

One example, Chiricahua Mts., Arizona (H. G. Hubbard). Type No. 3788, U. S. Nat. Mus.

Possibly not distinct from *Harrisina mexicana* Schaus, which I have not seen.

NOTES AND DESCRIPTIONS OF OSCINIDÆ.

By D. W. COQUILLET, Washington, D. C.

The insects comprising this family belong to the group of acalyptrate Diptera in which the auxiliary vein is imperfect or wanting, and the crossvein, which usually separates the discal from the second basal cell, is wanting, as is also the anal cell. The legs are short and rather robust. The only other family possessing these characters is the Ephydridæ, but in these the head is usually much broader than high, the aristæ of the antennæ are sometimes long pectinate on the upper side, the sides of the face are usually provided with bristles and the oral opening is often excessively large, none of which characters occur in the Oscinidæ.

In studying up the extensive series of specimens contained in the collection of the National Museum several new forms were met with, and it was found necessary to make a few corrections and additions to the genera given in Osten Sacken's catalogue. A large series of specimens of *Opetiophora straminea*, the type species of this genus, collected in Texas by Mr. E. A. Schwarz, shows that this genus is a synonym of

Hippelates. *Elachiptera* is the older name for *Crassiseta*, as *Mosillus* is of *Gymnopa*. The last named genus is not mentioned in Williston's recent manual. One European genus, *Eurina*, is now for the first time reported from this country, and a new genus, *Ceratobarys*, is erected for the *Hippelates eulophus* of Loew. The genus *Sigalæssa* of Loew, although placed by its author in the Asteidæ, and by Dr. Williston in the Drosophilidæ, may with propriety be admitted into the present family, from which it does not differ in any more important character than the shortened second longitudinal vein.

The genus *Elliponeura* is unknown to the writer in nature; all of the other genera reported from this country are represented in the National Museum collection.

Table of Genera.

- | | |
|------------------------------------------------------------------------------------------------------------|---------------------|
| 1. Costal vein terminating at the tip of the third vein | 2 |
| Costal vein continued to the fourth vein | 6 |
| 2. Hind crossvein present | 3 |
| Hind crossvein wanting | Elliponeura. |
| 3. Posterior femora not thickened | 4 |
| Posterior femora unusually thick | Meromyza. |
| 4. Front projecting in front of the eyes at least two-thirds the length of their horizontal diameter | 5 |
| Front not projecting more than one-half of the diameter of the eyes .. | Chlorops. |
| 5. Third joint of antennæ at least twice as long as wide | Ectecephala. |
| Third joint only slightly longer than wide | Eurina. |
| 6. Hind tibiæ each bearing a stout curved spur at tip of inner side | 7 |
| Hind tibiæ destitute of such spurs | 8 |
| 7. Antennal arista unusually broad | Ceratobarys. |
| Antennal arista slender | Hippelates. |
| 8. Tip of second vein less than the length of the hind crossvein beyond the first. | Sigalæssa. |
| Tip of second vein several times the length of the hind crossvein beyond the first | 9 |
| 9. Arista of antennæ not broadened | 10 |
| Arista unusually broadened | Elachiptera. |
| 10. Last section of fourth vein three or more times as long as the penultimate section | 11 |
| Last section less than twice as long as the penultimate section | Mosillus. |
| 11. Antennal arista bare or pubescent | 12 |
| Antennal arista short plumose | Gaurax. |
| 12. Epistoma noticeably produced forward | Siphonella. |
| Epistoma not produced forward | Oscinis. |

Descriptions of New Species.

Eurinaexilis, sp. nov.

Head yellow, the frontal triangle, antennæ, thickened base of the arista, the clypeus and occiput, except the sides and lower part of the latter, black; frontal

triangle polished, toward the sides striated, its lower end broad, rounded, reaching lower end of the front, sides of the latter bare; third joint of antennæ subquadrate, only slightly longer than broad. Thorax black, the sides and pleura yellow, the latter marked with four black spots, mesonotum coarsely punctured, scutellum yellow, convex. Abdomen black, the sides and venter yellow. Coxæ, femora and tibiæ reddish yellow, the middle of the hind tibiæ and all tarsi black. Halteres yellow. Wings grayish hyaline, third and fourth veins strongly diverging apically, hind crossvein twice its length from the small. Length, 4 to 5 mm.

Fourteen specimens, Beverly, Mass., June 4 and 20 (Edward Burgess), and Colorado (Carl F. Baker and H. K. Morrison). Type No. 3798, U. S. Nat. Museum.

***Chlorops aristalis*, sp. nov.**

Head yellow, the front triangle, third joint of antennæ, clypeus and occiput except the sides and lower part black, arista white, the thickened basal part yellow; frontal triangle polished, the sides converging to below the middle of the front, then as a narrow line extending to the lower edge of the front, sides of the latter bearing short, black, bristly hairs; third joint of antennæ one and one-half times as long as broad, concave above and convex below; palpi unusually large, projecting nearly one-third of their length beyond the anterior oral margin. Thorax yellow, the mesonotum subshining, marked with five nearly contiguous black vittæ, the pleura marked with three blackish spots; scutellum yellow, convex. Abdomen dark brown, the sides and venter yellow. Coxæ, femora and tibiæ yellow, the tarsi brownish. Halteres yellow. Wings hyaline, hind crossvein one and two thirds times its length from the small. Length, 3 to 4 mm.

Three specimens. North Carolina and southern Georgia. Collected by H. K. Morrison. Type No. 3799, U. S. Nat. Museum.

***Chlorops scabra*, sp. nov.**

Head yellow, the frontal triangle, second antennal joint and narrow upper edge of the third, the clypeus and occiput except the sides and lower part, black, arista brown, the thickened base black; frontal triangle polished, its sides converging to below middle of front, then nearly parallel, extending to lower end of front, sides of the latter bearing short black bristly hairs; third joint of antennæ orbicular, slightly shorter than wide. Thorax black, the sides and pleura yellow, one or two spots on the pleura, and the sternum largely black; mesonotum subshining, coarsely punctured; scutellum yellow, convex. Abdomen dark brown, the sides and venter yellow. Legs reddish yellow, a broad black band near middle of each hind tibia, apices of tarsi brown. Halteres yellow. Wings hyaline, hind crossvein over twice its length from the small. Length, 3 to 4 mm.

Two specimens. Oswego, N. Y. Collected July 17, 1896, by Professor Sheldon. Type No. 3800, U. S. Nat. Museum.

***Chlorops rubida*, sp. nov.**

Head yellow, an ocellar dot and narrow upper edge of the third antennal joint, black; frontal triangle polished, punctured, each puncture bearing a short hair, a me-

dian, longitudinal carina on lower half of the triangle sides of triangle converging to lower end of front, pointed at the apex, sides of front bearing short black bristly hairs; third joint of antennæ orbicular, slightly longer than wide. Thorax yellow, five dorsal vittæ and two spots on the pleura, reddish yellow; scutellum light yellow, flattened. Abdomen black, the ends, sides and venter yellow. Legs reddish yellow. Halteres light yellow. Wings hyaline, the hind crossvein slightly more than its length from the small. Length, 3 mm.

Two specimens. Colorado (H. K. Morrison), and Placer Co., Cal., in August (A. Koebele). Type No. 3801, U. S. Nat. Museum.

***Chlorops graminea*, sp. nov.**

Head yellow, an ocellar spot, one on lower part of the triangle, the third antennal joint, thickened base of arista and two vittæ on the occiput, black, sides of triangle partly or wholly brown, terminal portion of arista white; frontal triangle opaque, punctured, bare, the sides converging to lower end of front, the apex broadly rounded, sides of front bare; third joint of antennæ orbicular, slightly shorter than wide. Thorax yellow, opaque, five dorsal vittæ and three or four spots on the pleura, black-scutellum convex, yellow, toward the sides brown. Abdomen black, the narrow hind margin and sides of each segment, and middle of venter, yellow. Legs reddish yellow, apices of femora, both ends of the tibiæ, and bases of the tarsi, light yellow, Halteres yellow. Wings hyaline, hind crossvein slightly more than its length from the small. Length, 3 mm.

Two specimens, Lancaster, Cal. Bred by A. Koebele. Type No. 3802, U. S. Nat. Museum.

***Chlorops pullipes*, sp. nov.**

Head yellow, the frontal triangle, antennæ including the arista, the clypeus, palpi and occiput except the sides and lower part, brown or black; frontal triangle polished, the sides converging to lower end of front, sides of front bare; third antennal joint subquadrate, slightly longer than wide. Thorax polished, the dorsum black, sometimes marked with two yellow vittæ, pleura yellow, marked with four black spots; scutellum yellow, flattened. Abdomen black, hind margins of the fourth (usually) and fifth segments yellow. Legs brown or black, the trochanters, apices of femora, both ends of tibiæ, and bases of tarsi, yellow. Halteres yellow. Wings hyaline, hind crossvein slightly more than its length from the small. Length, 2 to 4 mm.

Sixteen specimens. Santa Fé, N. Mex. (T. D. A. Cockerell, in July and August), and Cañon City, Colo. (H. F. Wickham); other specimens from Colorado were collected by C. F. Baker and H. K. Morrison. Type No. 3803, U. S. Nat. Museum.

***Chlorops assimilis* Macq.** An examination of the type of *Siphonella obesa* Fitch proves that it is a synonym of the above mentioned species. *Chlorops trivialis* Loew and *C. bistriata* Walker belong in the same category.

Chlorops prolifica O. S. A study of co-types of this species received from Dr. J. A. Lintner, shows it to be a synonymy of *C. variceps* Loew.

Gaurax anchora Loew. This species has been re-described by Dr. Williston under the name of *Elachiptera dispar* in Forbush and Fernald's report on the Gypsy Moth, page 390.

Gaurax montanus, sp. nov.

Head black, the lower part of the front, antennæ, except the arista, face, cheeks, proboscis and palpi, yellow; frontal triangle polished, the sides convex, the lower end not reaching below lowest fourth of the front, sides of front opaque velvety; third joint of antennæ reniform, one and one-half times as broad as long, arista densely short plumose. Thorax polished black, a large yellow spot above the middle coxæ; scutellum semicircular, yellow, the extreme base brown. Abdomen black, the base yellow. Legs, including the coxæ, light yellow. Knob of halteres black, the stem yellow. Wings hyaline. Length, 2 mm.

Two specimens. Mt. Washington (Mrs. A. T. Slosson) and White Mts., N. H. (H. K. Morrison). Type No. 3804, U. S. Nat. Museum.

Hippelates capax, sp. nov.

Head black, the lower part of the front, the face, cheeks and palpi, yellow; frontal triangle subshining, the sides convex, the lower end not reaching below the lowest third of the front, sides of front except the lower part opaque velvety, each bearing a row of short bristles; third joint of antennæ circular, arista pubescent; vibrissæ rather large. Thorax, scutellum and abdomen black, subshining, the venter basally yellowish. Legs dark brown, bases of femora and of tibiæ, yellow. Knob of halteres bright yellow. Wings hyaline. Length, 3 mm.

Northern Illinois. A female specimen collected October 27, 1895, by Dr. W. A. Nason. Type No. 3805, U. S. Nat. Museum.

Hippelates bicolor, sp. nov.

Head black, lower part of the front, antennæ, except the extreme apex, and the arista, face, cheeks and palpi, yellow; frontal triangle polished, the sides concave, the apex reaching lower end of front, bristles on sides of front very short, vibrissæ wanting; third joint of antennæ reniform, one and one-half times as broad as long. Thorax and scutellum polished black, the latter semicircular, wider than long. Abdomen yellow, sometimes marked with a dorsal row of black spots and a lateral black vitta. Legs and halteres yellow. Wings hyaline. Length, 2 mm.

Lake Worth, Fla. Two specimens collected by Mrs. A. T. Slosson. Type No. 3806, U. S. Nat. Museum.

Siphonella inquilina, sp. nov.

Head black, the lower part of the front, antennæ, face, cheeks and palpi, yellow; frontal triangle polished, the sides convex, the apex not reaching below the lowest fourth of the front; third joint of antennæ orbicular, slightly wider than long; palpi projecting one third of its length beyond the oral margin. Thorax

black, polished, in front of the scutellum bearing numerous black, bristly hairs; scutellum black, subtriangular, along the sides bearing numerous black, bristly hairs and at the apex with a pair of bristles which are pressed together toward their tips. Abdomen black, the base yellow. Coxæ, femora and tibiæ black, the trochanters and tarsi yellow. Halteres yellow. Wings hyaline. Length, 2 mm.

Thirty-two specimens. Virginia; and St. Louis and Kirkwood, Mo. Type No. 3807, U. S. Nat. Museum.

***Oscinis virgata*, sp. nov.**

Head yellow, an ocellar dot, which sometimes extends over the entire frontal triangle, the occiput except the lower edge, the antennæ including the arista, the clypeus and apex of proboscis, black; frontal triangle polished, reaching only slightly below the middle of the front, the latter bearing numerous short, black bristles; third joint of antennæ suborbicular, slightly wider than long. Thorax subshining, yellow, the mesonotum marked with three black vittæ, a brown spot beneath the humeri and another beneath the wing; metanotum in the middle black; scutellum yellow, semicircular. Abdomen black, the venter yellow. Coxæ, femora and tibiæ yellow, outer side of front femora, and the front and hind tibia, tinged with brown; tarsi brown. Halteres yellow. Wings hyaline. Length, 3 mm. Colorado.

A specimen of each sex collected by Carl F. Baker. Type No. 3808, U. S. Nat. Museum.

***Oscinis pectoralis*, sp. nov.**

Head yellow, the frontal triangle, occiput except the lower edge, and the antennæ including the arista, black; frontal triangle polished, reaching only slightly below the middle of the front, the latter bearing black bristly hairs; third joint of antennæ nearly circular, slightly wider than long. Mesonotum subshining grayish black, the sides and pleura reddish yellow, a brown spot beneath the humerus and another near middle of pleura; scutellum grayish black, semicircular; metanotum black. Abdomen black, the base and venter yellow. Coxæ, femora and tibiæ yellow, the tarsi brown. Wings hyaline. Length, 3 mm.

Franconia, N. H. A female specimen collected by Mrs. A. T. Slosson. Type No. 3809, U. S. Nat. Museum.

***Sigalæssa flaveola*, sp. nov.**

Yellow, dorsum of thorax and of abdomen reddish yellow, the antennal arista and anterior oral margin black, a vitta on middle of occiput, a spot on front end of thorax, one above each humerus, a vitta on upper part of pleura and two spots on the lower part, brown; knob of halteres brown. Frontal triangle very small, scarcely exceeding the ocelli; third joint of antennæ orbicular, as long as wide. Wings hyaline, third and fourth wings strongly converging toward their tips, apex of second vein only slightly beyond the hind crossvein. Length, 1.5 to 2 mm.

Eight specimens. Franconia, N. H., Biscayne Bay, Fla. (Mrs. A. T. Slosson), and Washington, D. C. The specimens from the latter locality were collected on windows by the writer during May and July. Type No. 3810, U. S. Nat. Museum.

DIPTERA FROM THE LOWER RIO GRANDE OR
TAMAULIPAN FAUNA OF TEXAS—II.*

By C. H. TYLER TOWNSEND.

TABANIDÆ.

***Tabanus atratus* F.**

Two ♂♂. April 16, and July 11. Brownsville, Texas.

The eyes are slightly pubescent. First posterior cell completely closed, very short petiolate. Length, 20 to 22 mm.

SYRPHIDÆ.

***Eupeodes volucris* O. S.**

One ♀. May 2. Brownsville, Texas. Taken on foliage.

Length, 7 mm. Has ground color of abdomen brown, instead of black. This record extends the range of this species very considerably. It is a characteristic species of the Plains, belonging distinctively to the *Upper Sonoran* subregion, and is one of those species which indicate the extension of the dilute *Upper Sonoran* to the Lower Rio Grande region. There is a certain element of *Upper Sonoran* present in the *Tamaulipan* fauna; and it is interesting to reflect that the dilute *Upper Sonoran* reaches to, and actually meets and mixes with the dilute *Neotropical* here on the Lower Rio Grande.

***Baccha tropicalis* Towns.**

This species was described in Section I. It is most nearly allied to *B. notata* Loew of Cuba, a specimen of which from Florida has recently been identified by Mr. W. D. Hunter (with Dr. Williston's assistance). The Florida specimen, while stated to be a ♂ (Can. Ent. April, 1896, p. 97), possesses the peculiarities of wing coloration and abdominal markings distinctive of the ♀ of *tropicalis*. If it be a ♂, it is certainly a most aberrant one, judging from the usual sexual characters in this *Neotropical* group of *Baccha*.

NOTE.—While referring here to Mr. Hunter's papers, I wish to point out a few errors that he has made. In the Can. Ent. for April, 1896, p. 96, he states that up to that time there had been recorded only one specimen of *Baccha tarchetius* Walker, besides the type in the British Museum; and that that specimen was from New Jersey, collected by Mr. Keen, and is now in the National Museum. If he will refer to the Trans. Am. Ent. Soc. for March, 1895, p. 38, he will find

* Section I of this paper appeared in JOURN. N. Y. ENT. SOC. 1897.

that I recorded the species there from the District of Columbia, in a ♂ which I collected August 19. On page 101 of the same paper, Mr. Hunter says that, with the exception of Kansas records, *Spilomyia quadrifasciata* Say had not been recorded "outside of some of the extreme eastern States." I have recorded it from Michigan, in my paper above referred to. The fact that, throughout his paper, he repeatedly quotes Snow's records of species from Colorado and New Mexico, and entirely ignores my previous records of the same species of Colorado, New Mexico and Arizona, indicates that my paper was not seen by him. The drawing of broad statements as to distribution, without consulting the literature bearing on the subject gives rise to wrong impressions and can not be too strongly condemned; especially when it is remembered that my paper was a long and important contribution, on Syrphidæ particularly as well as other diptera, and appeared fully a year before, and in such a prominent medium as the Transactions of the American Entomological Society!

***Volucella tamaulipana*, sp. nov.**

♂ ♀. Length, $5\frac{1}{2}$ to $8\frac{1}{2}$ mm., both sexes ranging through these sizes.

The ♀ in life is easily distinguished by having a lighter or more yellowish abdomen and scutellum than ♂. This is not by any means apparent in dried specimens. Front and face light yellow, face much produced downward to a blunt point; face and front white-pilose, vertex with black hair, cheeks with heavy shining black or brown stripes; facial stripe much less distinct, fuscous, brown at oval margin. Face very gently concave above the slight tubercle. Frontal vitta moderately broad, shining brown, lighter anteriorly. Frontal triangle yellow, tinged with fuscous along middle, hairs somewhat brownish. Antennæ about half as long as face, reddish-yellow; third joint subequilateral, a little bulged on edges of basal portion, and slightly narrowed on apical portion; arista hardly as long as antennæ, thinly long hairy above, and more thickly short hairy below. Thorax greenish-black, thickly clothed with short yellow hair, with a patch of black hair on posterior central portion of disk next the yellow prescutellar spot, whole of scutellum and larger or smaller prescutellar spot bright yellow, the wide lateral margins of thorax same except a fuscous space immediately above base of wings. A yellow spot on pleuræ directly below humeri, and a fuscous pale area in front of wing bases. Hair of scutellum bright yellow on anterior half or less, abruptly black on posterior half. Some longer weak bristles or hairs on edge of scutellum. Metanotum shining black, with an arcuate line of yellow next scutellum, and a fuscous area between. Disk of scutellum, viewed from above, appears broadly fuscous. Abdomen of a general yellowish brown; first segment blackish in middle, and black on narrow hind border; second segment wholly light yellow, except the sinuate hind margin blackish or brown, or with a median line of the brownish separating the elongate lateral yellow markings. Third segment with the same yellow markings quite distinct on anterior half of segment in some specimens, more or less distinctly divided by a median vitta,

in others very indistinct. When distinct these spots are usually evenly rounded on whole hinder border, and often reach to but little short of hind margin of segment. Fourth segment usually yellow on anterior lateral portion, often indistinct in dried specimens. Pubescence of fourth segment wholly white; of third white on front margin, very narrowly on median line but covering about half the length of segment on sides; pubescence of second white on about anterior half, somewhat irregularly following the yellow markings. Rest of pubescence of abdomen black. Pubescence of venter white, except near apex. Legs yellowish-brown, the knees yellowish, the tarsi clear brownish-yellow except last two joints (and sometimes tip of next) black. Second vein strongly sinuous near extremity. Wings hyaline, narrowly tinged with yellow along whole costa; less than the oblique apical third yellowish fuscous, with brown cloud on section of second vein at extremity of marginal cell, and a subhyaline space before it. A lighter space in end of first posterior cell. Heavy clouds on anterior crossvein, the crossveins at tip of second basal cell, and the origin of third vein. Brown cloud of stigma connected with that of anterior crossvein by a fuscous patch. Clouds of origin of third vein and tip of second basal cell are also connected by fuscous. Fuscous of tip narrowly and irregularly extended along inner margin of wing. The proximal boundary of the apical fuscous of the wing extends approximately from the end of the dilute stigma obliquely across to the end of second posterior cell.

Eleven ♀s, and twenty-four ♂s, as follows: All the ♀s June 24, except one June 28: all the ♂s June 24, except two June 25, one June 28, and one July 3, near Brownsville, Texas. All on flowers of *Lippia lanceolata* Michx., except two ♂s (June 25) which were hovering in air under shade of a large tree in woods. Others were seen hovering in this manner and poised in the air, in company with them. *In copula* June 24.

This species belongs to the group of *V. pusilla*, *satur*, etc. The apical fuscous of the wing has the same inner boundary shown in the figure of *pusilla* given by Williston (Synopsis Syrph. pl. 6, fig. 3). It is one of the short, stout species, with the abdomen subround, and wider than the thorax.

CONOPIDÆ.

Zadion albonotatum Towns.

The species was described in Section I. It is on the order of *Z. splendens* Jaen., being practically, so far as effect goes, a melanistic and intensified color form of that species. It is, however, a perfectly good species, being quite distinct in its emphatic coloring.

NOTES ON SIPHONAPTERA, WITH DESCRIPTIONS OF FOUR NEW SPECIES.

BY C. F. BAKER.

Early in the course of my studies on the Siphonaptera I wrote Dr. Berg in Buenos Ayres, relative to the *Pulex grossiventrix* of Weyenberg which I had referred to *Sarcopsylla*. He very kindly sent me specimens of both male and female. These show some remarkable characters which justify the foundation of not only a new genus but a new family. I would here again call attention to the fact that we have yet no record of any fleas from bats in this country. The bat species are among the most interesting. I hope collectors having the opportunity will certainly secure specimens from any of our bats.

Family MEGAPSYLLIDÆ, fam. nov.

Body very large in the pregnant female, but the abdomen does not lose the normal texture or structure, the sutures remaining distinct, although much connective membrane is exposed between the plates. Antennæ normal. Eyes very large, in a rather small head. Mouth parts very stout, the labial palpi six or seven jointed (impossible to say which without dissection). Fourth tarsal joint very small, more or less connate with fifth, causing the tarsi to appear four-jointed. Last tarsal joint and claws greatly enlarged, the spines on the former inclining to somewhat foliaceous.

Megapsylla, gen. nov.

Head evenly rounded above in female, uneven and unituberculate in front in the male. Prothorax in the female with five or seven remote, short, stout, dark brown teeth; in the male unarmed. Fore tibiæ very small and short, but swollen. Maxillæ small, extending only to one-half of second joint of maxillary palpi.

Megapsylla grossiventris (*Weyenb.*).

1879, WEYENBERG, Boletín de la Acad. Nat. de Ciencias Repub. Argent. III, p. 188. (*Pulex grossiventris*.)

1895, BAKER, Can. Ent. XXVII, p. 3. (*Sarcopsylla grossiventris*.)

Length of ♂ 2.5–3.5, of ♀ 4 mm. to often 6.5 mm. when pregnant. Head and thorax, with legs, reddish to dark brown, abdominal plates dark smoky. Edges of antennal groove very minutely and thickly spinose. Sparingly bristled, but the bristles stout; the spines on the legs heavy, those on the fore tibiæ becoming very thick and tooth-like, and those on the fifth tarsal joint more or less flattened. Claws very large and recurved to the length of the fifth tarsal joint. Dorsal segments each with a single row of long bristles, six on a side. Upper claspers of male very large, naked, twice as long as broad, sides subparallel, tips obliquely cut off downward and backward.

Lives on the Armadillo (*Dasypus minutus*) in the Argentine Republic (Weyenberg and Berg.)

Pulex longispinus *Wagner*, Horæ. Soc. Ent. Ross. XXIII, 1889, p. 355.

Pulex lamellifer *Wagner*, *ibid.* XXIX, 1895, p. 504.

The descriptions of these two species did not come to my hands until after the publication of the Preliminary Studies. They both belong in my Division I of the genus. The former name was also unfortunately used by me. To the species described under this name by me I will now give the name *divisus*. An examination of further material may show it to be a *Typhlopsylla*.

Pulex multispinosus, sp. nov.

Male. Length, 3 mm. Head flat above, strongly rounded in front, face nearly vertical. Eye rather small but distinct, and near lower edge of head. Antennal groove extending obliquely through center of head to near upper margin; near the lower edge of head, with three very long and stout spines and three smaller in front and three long and stout ones behind. Bristles on second antennal joint as long as third joint. Labial palpi about equalling fore coxæ in length. Pro-, meso, and metanotums of nearly equal length, their discs with numerous small bristles; the pronotum provided with a "comb" of about forty teeth. Dorsal segments, each with one row of medium-sized bristles, twelve on a side, and two rows of minute bristles; ventral segments with a single row each, of four or five on a side. Tarsal spines, all small and weak, especially those on fore tarsi. In fore tarsi joints 2 and 5 are of equal length, a little longer than 1 and about equalling 3 and 4 together. In middle tarsi joints 2 and 5 are of equal length and about three-fourths of 1 which equals 3 and 4 together. In hind tarsi 1 equals 2 and 3 together, 2 equals 3 and 4 together, while 5 is scarcely half of 1. The decrease in length and width of joints in hind tarsi is very marked. Upper claspers very short and broad, trapezoidal in shape and unarmed.

Described from one male collected at Raleigh, N. C., by Messrs. H. H. and C. S. Brimley. The host is the Rabbit (*Lepus sylvaticus*.) This species belongs to my Division II, but is widely distinct from any described species. It has a greater number of teeth in the pronotal comb than any described flea excepting *Hystrihopsylla obtusiceps*.

Pulex gillettei *Baker*.

Prof. A. P. Morse has taken this species on the Screech Owl (*Megascops asio*) at Wellesley, Mass. The habits of the birds of prey make them at least temporary hosts for several species of fleas usually found elsewhere.

Pulex howardii *Baker*.

This flea is proving to be one of our most common and widely distributed species, both geographically and as to hosts. Mr. D. B. Young

has collected it at Newport, Herkimer Co., N. Y., on the Wood-chuck (*Arctomys monax*) and the Flying Squirrel (*Sciuropterus volucella*). Mr. Hubbard has taken it from a nest of the Silvery Mouse (*Cereus giganteus*) at Tucson, Ariz., and in debris of the Colorado River at Yuma, Ariz.

***Pulex brunneri* Baker.**

Collected by Professor J. M. Aldrich at Moscow, Idaho, on the Sperophile (*Spermophilus columbianus*).

Belonging to a group of my Division II, which is composed of essentially American species. This group includes *hirsutus*, *coloradensis*, *brunneri*, *montanus* and *divisus*, and is distinguished by having one or both of the apical spines on the second joint of hind tarsi greatly elongated and exceeding in length joints 3 and 4 together.

***Pulex arizonensis*, sp. nov.**

Male. Length, 2 mm. Head evenly rounded from occiput to mouth. A few bristles below, before and behind antennal groove. Bristles on apex of second antennal joint few but long. Eyes normal. Labial palpi somewhat exceeding fore coxæ. Pronotal comb of eighteen spines. Dorsal segments with two rows of bristles each, the principal row of six to seven bristles on a side. Fore and middle tarsi very weakly spined, hind tarsi with spines long and slender. In fore tarsi joints 1 and 3 are of equal length and a little shorter than 2, while 5 is as long as 1 and 2 together. In middle tarsi joints 1, 2 and 5 are subequal in length and as long as 3 and 4 together. In hind tarsi joint 5 equals 3 and 4 together, and is somewhat shorter than 2, while 1 equals 2 and 3 together; the bristles on the apex of joint 1 are about as long or shorter than joint 2. Upper claspers unarmed, little more than twice longer than wide, sides subparallel, bent below, apex rounded.

Described from a male taken by Mr. Hubbard at Tucson, Ariz., in a nest of Silvery Mouse.

***Typhlopsylla pectiniceps* Wagner.** Horæ Soc. Ent. Ross, XXIII, 1889, p. 347.

***Typhlopsylla bidentatiformis* Wagner.** Ibid., p. 351.

These are two other species previously also overlooked by me. The former is widely distinct from any other *Typhlopsylla* by reason of having combs of fourteen teeth each on either side of the head. The latter is quite near the *unipectinata* of Taschenberg.

***Typhlopsylla assimilis* Tschb. (var. ?).**

Three females, nearer this species than any other, were taken on the Screech Owl (*Megascops asio*) at Wellesley, Mass., by Professor A. P. Morse. This occurrence is to be considered accidental. These

specimens cannot at present be definitely referred to this species without the males.

***Typhlopsylla nudata*, sp. nov.**

Female. Length, 2 mm. This species is well distinguished by the almost entire absence of bristles on the body, coxæ and femora. The labial palpi about equal, the maxillary palpi somewhat exceed, the fore coxæ in length. Head otherwise normal, no vestige of eyes. Spines of tibiæ few and rather weak, spines on fore and middle tarsi very weak, almost entirely absent on the former; on hind tarsi long and slender, those on apex of first joint shorter than joint 2, but one of those on apex of joint 2 is much longer than joints 3 and 4 together, as in *Pulex bruneri* and allies. Middle and hind femora apparently deeply emarginate behind, before the apex, with an acute tooth before the emargination, a character not before noted in any American flea (Skuse mentions it for his *Stephanocircus*). In fore tarsi joints 1, 2, and 3 are subequal in length and little longer than 4, while 5 equals 1 and 2 together. In middle tarsi joint 5 equals 3 and 4 together and is a little longer than 1, the first four joints decreasing in length in this order, 1, 2, 3, 4. In hind tarsi joint 5 equals 3 and 4 together and 1 equals 3, 4, and 5 together, while 2 is somewhat longer than 5.

Described from two females taken by Mr. Hubbard from inner nest of *Neotoma albigula*, at Tucson, Ariz. This is the most interesting species of the genus yet found in North America. When the final disrupting of *Typhlopsylla* comes this will fall in a genus by itself.

***Typhlopsylla charlottensis*, sp. nov.**

Female. Length, 1.75 mm. Head with two oblique rows of spines, the lowest much the stronger. Bristles on apex of second antennal joint short. Labial palpi nearly equalling fore coxæ. Pronotal comb of fourteen stout teeth. Dorsal segments with two rows of bristles, the principal row of five to seven long stout bristles on either side; ventral segments with three to four on a side. Fore coxæ strongly bristled. Spines of fore and middle tarsi very weak, of hind tarsi strong. In fore tarsi joints 1 and 2 are equal in length, 5 equals 3 and 4 together, and 4 is one-half of 1. In middle tarsi 1 equals 2 and 3 together or 4 and 5 together, while 2 equals 5. In hind tarsi spines all short, joint 2 is three-fourths of 1, equals 3 and 4 together and is one-fourth longer than 5.

Described from two females taken in a mouse nest at Massett, Queen Charlotte Islands, by Rev. J. H. Keen. It is nearest to *americana*, from which, however, it is very distinct as described above.

NOTES ON LEPIDOPTERA.

BY W. J. HOLLAND, LL.D., F.Z.S., &c.

The species named *Lycæna fuliginosa* by Mr. W. H. Edwards and as such listed in his Catalogue of the Butterflies of North America, published as an Appendix to the First Volume of the Butterflies of North America, has been in the Catalogue annexed to Volume II transferred to the genus *Thecla*. This is a palpable error, as an examination of the types reveals. I called the attention of Dr. Skinner to this fact long ago, and recently upon the occasion of a short visit paid me by Mr. Beutenmuller, I likewise called his attention to it. The fact seems to be worthy of publication. Edwards was right in his original location of the species. The upper side is of a uniform grayish brown and the markings of the underside as well as the form of the wings are of a truly lycænine character.

Entomologists have been puzzled for many years past by their failure to discover anywhere within the limits of the United States specimens of the species named *Pamphila omaha* by Mr. W. H. Edwards. The original description, which appeared in the Proceedings of the Entomological Society of Philadelphia, Vol. II, p. 21, stated that the type came from "Pike's Peak" and was contained in the collection of Mr. Newman, of Philadelphia, the well known collector, of whom the writer cherishes pleasant memories. In a letter recently received from Mr. Edwards he tells me that the specimens were collected by Mr. William Wood. Wood, I am informed, was a taxidermist, who also traded in a small way in insects, and had a lot of miscellaneous stuff in his shop coming from all sorts of places. He was not at all careful, so I am told, and but little dependence could be placed upon his locality labels, which were as likely to be incorrect as correct.

After Mr. Edwards had written his original description of *P. omaha* he returned the types to their owner. If I am not mistaken they are contained at present in the collection of the American Entomological Society of Philadelphia. At all events, two specimens labelled *Pamphila omaha* Edwards, are to be found there, corresponding perfectly with the description given by Edwards. They are mounted on common pins, not insect pins.

In the Edwards Collection there is a single specimen of *Pamphila omaha*, marked "*P. omaha*, = *mingo*, Edw., Kanawha Co., W. Va."

Mr. Edward writes me that so far as he is able to recall the facts this specimen, which is the original type of his *Pamphila mingo*, was taken,

as the label states, in Kanawha County. He tells me that having returned the types of *P. omaha*, he fell inadvertently into the error of re-describing the species three years afterwards under the new name.

In my studies of the Hesperiidæ I have been led to amass an exceedingly large collection of the Hesperiidæ of the world, and the other day Dr. Barnes, who was with me spending a little time in the examination of the Edwards Collection, called my attention to the obvious identity of *P. omaha* with the East Indian *Telicota mæsoïdes* Butler, of which I possess a large series of specimens. I had not noted the fact before, but, when my attention was called to it, the positive identity of the two things became at once manifest.

I strongly suspect that *Pamphila omaha* Edwards is not a native of this country. If we had only to do with the types originally acquired by Mr. Newman from William Wood I should have no hesitation whatever in saying that we are dealing with an error brought about by a mistaken locality-label. The assertion of Mr. Edwards that the type of *P. mingo* was taken in Kanawha County is the great obstacle to such a conclusion. Still it is possible that Mr. Edwards was mistaken also.

Elwes in his recent Revision of the Oriental Hesperiidæ, published in the Transactions of the Zoological Society of London, Vol. XIV, p. 254, gives the synonymy of the species. I reproduce it here, intercalating the additional synonyms of American origin:

Telicota dara Kollar.

Hesperia dara KOLLAR, Hugel's Kaschmir. Vol. IV, p. 455 (1848).

Hesperia omaha W. H. EDWARDS, Proc. Ent. Soc. Phil. Vol. II, p. 21 (1863).

Pamphila mæsa MOORE, P. Z. S., 1865, p. 509, Pl. XXV, fig. 9.

Hesperia mingo W. H. EDWARDS, Proc. Ent. Soc. Phil. Vol. VI, p. 207 (1866).

Pamphila flava MURRAY, Ent. Mo. Mag. XII, p. 4 (1875).

Pamphila nitida MABILLE, Pet. Nouv. II, p. 114 (1877).

Pamphila taxilus MABILLE, Ann. Soc. Ent. Belg. XXI, p. 38 (1878).

Carterocephalus omaha STRECKER, Butt. and Moths of N. A. p. 175 (1878).

Pamphila trachala MABILLE, Pet. Nouv. II, p. 237 (1878).

Pamphila mæsoïdes BUTLER, Trans. Linn. Soc. Lond. Ser. 2, Zool. Vol. I, p. 554 (1879).

Padraona mæsoïdes MOORE, Lep. Ceylon, I, p. 171, Pl. LXXI, figs. 5, 5a (1881).

Carterocephalus omaha EDWARDS, Butt, N. A. Appendix (1884).

Telicota mæsoïdes DISTANT, Rhop. Malay. p. 383, Pl. XXXIV, fig. 24 (1886).

Padraona pseudomæsa MOORE, Lep. Ceylon, I, p. 170 (1881).

Padraona dara WATSON, Hesp. Ind. p. 57 (1891).

Padraona dara LEECH, Butt. China etc. p. 596, pl. XL, figs 13, 14, vars. (1891).

Pamphila heterus MABILLE, Compt. Rend. Soc. Ent. Belg. III, no. 31, p. 72 (1883).

Pamphila heterus STAUDINGER, Iris, II, p. 145 (1889).

Padraona heterus SEMPER, Schmett. Philipp. p. 303, Pl. XLIX, fig. 15, ♀ (1892).

Whether all of the several forms thus merged under *Telicota dara* Kollar, are positively identical may perhaps be questioned a little, but of the identity of *T. omaha*, with the form described as *P. masoides* by Butler there is not a shadow of doubt.

Mr. Elwes, in his revision of the Hesperiidæ of the Oriental Region referred to in the foregoing paragraph, describes as a new species a *Telicota* to which he gives the name of *simplex* (Cf. p. 253, Pl. XIX, Fig. 15, ♂). This is the same species which I described in the Proceedings of the Boston Society of Natural History, Vol. XXV, p. 79, Pl. IV, fig. 4, under the name *Telicota subrubra*. I do not much wonder that from the wretched figure I gave, Elwes was unable to make out the species, and I am thankful to him for having given so good a figure. Of course, his name sinks as a synonym. Had he noted my description and asked for information as he did in reference to some other species, I might have helped him to avoid the error. His work is a splendid contribution to our knowledge of the subject, and minor errors of this sort are likely to occur in the case of the most careful student.

Much has been written concerning *Limenitis floridensis* Strecker, and *Limenitis eros* W. H. Edwards. The latter author insists upon the distinctness of his species from that named by Strecker. I cannot agree with him. With the type of *L. eros* before me, and after having carefully examined the insect named *L. floridensis* by Strecker, I am sure of the identity of the two. Strecker's name has priority.

What is *Zeuzera canadensis* Herrich-Schaeffer? Under this name the distinguished lepidopterist of Ratisbon named and figured a species of *Zeuzera*, which, he informs us, came from "Quebeck" (*sic*). From the time of the publication of his plate to this present hour no such insect has turned up on American soil. I recently purchased, while in London, a set of a *Zeuzera* from Natal, which is undoubtedly the insect figured by Cramer as *Noctua asylus* (Pap. Exot., Pl. 137, fig. C). Is not this species of Cramer the same as the one figured by Herrich-Schaeffer? It looks to me as if possibly *Z. canadensis* might be an African form, and that we are dealing in this case again with a mistaken locality-label. *Quien sabe?* *

* I was tempted to drop a line to Dr. A. G. Butler of the British Museum requesting him to confer with Sir George F. Hampson and let me know whether my

REPLY TO DR. DYAR'S NOTE.

BY A. RADCLIFFE GROTE.

In reply to Dr. Dyar's note, this Journal, V, 66, I would state that, having no preparations of the larvæ, I may have failed to follow entirely Dr. Dyar's remarks and any misstatement of them has arisen in this way. I would suggest that Dr. Dyar figure them in outline as I have done with the neururation. I consider the "stinging spines" as adaptive, secondary characters, unfit for classificatory purposes of this nature and not decisive of phylogeny. With regard to the anal tubercle, Dr. Dyar regards it as primary—of this I cannot judge, but naturally accept this dicta. And this is the only main point. I regard the pattern of neururation as "primary" and that it unites, in one phylogenetic group, *Hemileuca* and *Saturnia* and *Automeris* and *Aglia*. As to other characters, the structure of the female antennæ appears to fall in very well with my classification as also the specializations of the pupal envelop. This whole case seems to converge into: anal tubercles *vs.* pattern of neururation. It is a test case and should be settled before we go any further. It appears to me a physiological impossibility that *Aglia* should be derived from the Saturnian branch or that *Hemileuca* should be derived from the Aglian stem. From his point of view Dr. Dyar thinks the reverse and hence a settlement of the controversy, which should not be suffered to run into side issues, is very desirable.

surmise as to the identity of *Z. canadensis*, H. S. with *Z. asylas* of Cramer met with their approval. I have just received the following reply contained in a letter written January 1st, 1898.

"As desired, we have looked into the identity of *Zeuzera asylas* Cram. and *Z. canadensis* H. Sch., and have come to the conclusion that you are quite correct in the belief that both figures represent the same African species. We have nothing approaching it from any temperate country and all the species of this type appear to be inhabitants of the tropical parts of the old world."

I accept it then as established that *Zeuzera canadensis* H. Sch. is a synonym for *Z. asylas* Cram., and the species should be stricken from our lists of North American species. Herrich-Schaefer's locality "*Quebeck*" was evidently an error.

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STUDIES IN THE PTINIDÆ, CIOIDÆ AND SPHIN- DIDÆ OF AMERICA.

BY THOS. L. CASEY.

The term "America," in the above title, is employed to designate that portion of the American continent embraced within the boundaries of the United States. There should be no more ambiguity in designating the United States of America as America simply, than in calling the United States of Brazil, or the United States of Colombia by the last word of their respective titles. It may perhaps be considered egotistical for us to appropriate to ourselves the name characterizing the continents of the western hemisphere, but as we have no other title to distinguish us among the numerous aggregates of united states which compose these continents, there is no reasonable motive for avoiding the apparent conceit.

PTINIDÆ.

PTILININI.

The insects of this tribe form an appropriate introduction to the Bostrichinæ, for they are evidently a connective bond with the Anobiini. Our species have not been studied for many years. We have two genera as follows:—

Antennæ strongly flabellate in the male, serrate in the female.....**Ptilinus**
Antennæ slender and feebly serrate in the male, shorter and somewhat stouter but
rather more strongly serrate in the female.....**Euceratocerus**

The eyes are rather larger and more convex in *Euceratocerus* than in *Ptilinus*, but are much smaller in the female than in the male. Selecting the apparent males by this character I have been unable to observe any pectination of the male antenna in *pleuralis*, though it may exist in *horni*, of which I have not seen the male.

Ptilinus Geoff.

The long slender pubescent appendages of the male antenna are not an extreme development of the usual serriform structure, but project from the base of the joints, the joints themselves being slender and sometimes cylindrical. In the female, however, the joints are prolonged outwardly and in an obliquely anterior direction, forming a truly and quite strongly serriform antenna. The males differ from the females not only in the structure of the antennæ but in the much denser sculpture of the entire body, and frequently to a very great degree in the form of the prothorax. In the following table of the species included within my cabinet, all the discriminating characters refer to the female, except in the case of *flavipennis*, of which the only known example is a male:—

Color uniform throughout or very nearly, the elytra not paler.....	2
Color blackish, the elytra flavate.....	8
2—Prothorax sinuate at the sides subapically, the apex more or less prominent in a rounded or feebly sinuate lobe.....	3
Prothorax arcuately oblique subapically, the apex angulate and slightly prominent	6
Prothorax broadly and evenly arcuate at apex, feebly sinuate in the middle.....	7
3—Elytra distinctly punctured only toward the base, the punctures nearly obsolete toward tip; thoracic lobe feebly and evenly crenulate. California. <i>basalis</i> Lec.	
Elytra distinctly punctured throughout.....	4
4—Thoracic lobe narrowly rounded and with a few closely approximate serrules at tip. Pennsylvania to Indiana.....	<i>ruficornis</i> Say
Thoracic lobe broadly rounded, with a feeble cuspidiform emargination and minutely and evenly serrulate throughout.....	5
5—Scutellum elongate, finely and densely rugose; epipleuræ gradually wider at base.	

Female.—Body rather stout, cylindrical, dark piceo-castaneous in color throughout, the legs scarcely, the antennæ much, paler; lustre rather dull, the pubescence very short and dense on the elytra. Head convex, minutely and densely granulate, the transverse frontal impression distinct. Prothorax distinctly wider than long, widest at about the middle, narrowed slightly to the base, rapidly and just visibly sinuate to the apical lobe; surface minutely and densely granulose toward base, more coarsely, sparsely and irregularly so toward apex, the median line finely impressed. Elytra three-fourths longer than wide, equal in width to the prothorax, minutely and densely subgranulose in texture, with the punctures rather strong, sparse and distinct, feebler toward tip, where they are more distinctly intermingled with small granules and the ground lustre is more shining. Length 4.0 mm.; width 1.5 mm. Nebraska. *lobatus*, sp. nov.

Scutellum quadrate, coarsely rugose; epipleuræ rapidly wider at base. *Male*.—Cylindrical, opaque, black, the legs scarcely paler, the antennæ pale rufous, the rami infuscate; pubescence extremely minute and not very conspicuous. Head convex, dull, minutely subgranulose, the eyes convex, separated on the front by about four times their own width. Prothorax about a third wider than long, broadly, evenly arcuate at base, gradually narrowed and arcuate at the sides from

the broadly rounded basal angles to the apex, the latter much narrower than the base and evenly and more strongly arcuate; surface densely granulato-rugose throughout, the median line very fine and subobsolete. Elytra three-fifths longer than wide, rather wider than the prothorax and much more than twice as long, very densely granulato-rugose and opaque, the punctures distinct throughout, with about two impressed series along the lateral margin. *Female*.—A little larger and paler in color than the male, with more shining elytra, upon which there are more distinct traces on each of three or four feeble ridges. Prothorax larger, fully as wide as the elytra, rounded at the sides, widest just behind the middle, the surface more sparsely and decidedly granose toward tip. Elytra scarcely three-fifths longer than wide, twice as long as the prothorax. Length 3.0-3.5 mm.; width 1.1-1.2 mm. Indiana,.....**pruinusos**, sp. nov.

- 6—Elytral punctures only distinct near the base, where they are fine. *Female*.—Evenly cylindrical, piceous, the legs and antennæ paler; pubescence very short, even, extremely dense, yellowish in color and conspicuous on the elytra; lustre rather shining. Head evenly convex, minutely granulato-rugose, the epistomal impression small and rather feeble. Prothorax not quite as long as wide, the sides parallel and feebly arcuate; apex broadly and evenly ogival; surface minutely granulose, becoming nearly smooth at the sides toward base, the granules coarse and pronounced toward apex except laterally. Scutellum quadrate, feebly convex, dull. Elytra fully three-fourths longer than wide, about twice as long as the prothorax, smooth and alutaceous, without trace of impressed lines at any part. Abdomen rather convex, the second segment somewhat longer than the first. Length 2.8-4.0 mm.; width 0.9-1.4 mm. California (Sta. Cruz Mts.).

acuminatus, sp. nov.

- 7—Elytra with fine, even and somewhat impressed striæ in both sexes. *Male*.—Cylindrical, blackish, the elytra generally a little paler; legs and antennæ pale, the flabellum infuscate; surface dull, the humeral callus more shining. Head short, inserted to the eyes which are well developed and strongly convex; surface but feebly convex, densely scabrous and opaque; antennal joints very short, the rami very long and slender. Prothorax a little shorter than wide, parallel and straight at the sides, broadly and evenly rounded in apical third or fourth, with a minute sinus at the middle; surface coarsely, densely and roughly granulato-scabrous throughout the width, becoming much more finely so and smoother toward base. Scutellum moderate, subquadrate. Elytra three-fourths longer than wide, a little more than twice as long as the prothorax and rather wider, densely dull and finely granulato-rugose, the second and fifth intervals uniting and rather convex near the declivity, the ninth also becoming broader and slightly convex behind. *Female*.—Rather shining and dark rufo-testaceous throughout, the prothorax similar in form but rather shorter and fully as wide as the elytra, with the rugulosities more distinct and isolated, nearly smooth toward base, the head more elongate, narrower and with the eyes small and distant from the prothorax; elytra rather flattened on the posterior declivity, with the intervals slightly uneven. Length 3.0-4.2 mm.; width 0.9-1.4 mm. California (Sta. Cruz Mts.).....**ramicornis**, sp. nov.

- 8—Elytra with rather strong punctures unevenly arranged throughout. *Male*.—Cylindrical, blackish and opaque, the elytra flavate and less dull; legs paler, the

antennæ pale flavate; pubescence short, fine and moderately distinct. Head rather short, inserted nearly to the eyes, which are well developed and very convex; surface moderately convex, dull and subscabrous; antennæ moderate in length, the rami unusually short and gradually thickened from their bases, the ramus of the fourth joint three times as long as the joint. Prothorax distinctly shorter than wide, the outline broadly parabolic from the base continuously around the apex, the sides becoming almost parallel near the base, which is broadly arcuate, finely margined toward the middle; surface densely granulato-scabrous, larger individual granules but slightly evident toward tip. Scutellum longer than wide, dull, obtuse at tip as usual. Elytra three-fourths longer than wide, twice as long at the prothorax and scarcely wider, the punctures equally visible throughout, rather large but sparse and with but the vaguest suggestion of lineal arrangement. Length 2.4 mm.; width 0.8 mm. California (Los Angeles Co.) **flavipennis**, sp. nov.

The female in this genus generally has a short acute transverse ridge near the apex of the last ventral segment, but in *ramicornis* the fifth segment is simple in that sex, having merely a very small and shallow impression at the apex. The male usually has the fifth ventral simple or slightly more convex at the apex, where it is broadly and evenly rounded.

Acuminatus is represented before me by seven females varying greatly in size, and the male is apparently rare; on the other hand *ramicornis* is represented by nine specimens, only two of which are females. *Thoracicus* Rand., is not known to me at present and is therefore omitted from the table.

Euceratocerus Lec.

The fifth ventral segment is generally impressed in the female of *Euceratocerus* and is rather shorter than in the male, where it is simple. The species are all elongate and subcylindrical, though rather less convex than in *Ptilinus*, the head minutely and densely granulose, the prothorax less minutely and very clearly and evenly granulate throughout the disk, but rather more densely at the summit of the more convex median parts near the base. The elytra have very fine, scarcely impressed striæ, which extend nearly to the apex in *horni*, and that species is well distinguished from any of the California representatives by the two basal impressions of the pronotum. The species are very much more closely allied among themselves than those of *Ptilinus*, and the male appears to be very rare in comparison with the female. The four species in my cabinet may be identified as follows from the female:—

Basal joint of the hind tarsi very much shorter than the entire remainder, the second joint relatively more elongate; pronotum impressed at each side near the basal margin; elytra more elongate; eyes separated by rather less than three times their own width. Texas, **horni Lec.**

Basal joint but slightly shorter than the entire remainder, the second joint relatively much shorter; pronotum not impressed sublaterally at base. 2

2—Pleural sulcus below the humeri deep and strongly marked; elytra twice as long as wide; eyes separated by evidently more than three times their own width. Body rather stout, the elytra subdilated near the tip, blackish-piceous above, the legs and antennæ dark rufous or rufo-piceous; surface feebly shining, the pubescence extremely short, pale, dense and conspicuous on the elytra. Head short, inserted to the eyes, dull, the epistomal impression well marked. Prothorax three-fifths wider than long, rounded at apex, the sides thence strongly diverging and feebly sinuate, becoming parallel and broadly rounded in basal half; basal angles rounded. Elytra twice as long as wide, more than three times as long as the prothorax and fully as wide, a little wider at apical third; humeral angles rounded. Length 3.7-4.5 mm.; width 1.3-1.7 mm. California (Sta. Cruz Mts.) **pleuralis**, sp. nov.

Pleural sulcus narrow and feeble. 3

3—Elytra fully twice as long as wide; eyes small, separated by fully four times their own width. Body very slender, nearly as in *pleuralis* but narrower, the elytra not distinctly wider behind and fully three and one-half times as long as the prothorax, the latter nearly similar in outline but still more transverse, the sides becoming parallel in less than basal half, with the median line similarly finely impressed anteriorly. Length 2.9 mm.; width 1.0 mm. California (locality not indicated) **macer**, sp. nov.

Elytra much shorter, three-fourths longer than wide; eyes more convex and better developed, separated by three times their own width. Body suboblong, moderately convex, dull, blackish, almost similar throughout to *pleuralis* but shorter, the prothorax relatively rather smaller and the elytra much shorter, not distinctly dilated subapically, and with the minute subgranuliform rugulosity still finer and the pubescence a little denser, the fine striæ distinct to the summit of the convex declivity. The hind tarsi are longer than in *pleuralis*. Length 3.4 mm.; width 1.25 mm. California (locality not indicated) .. **saginitus**, sp. nov.

The descriptions are derived throughout from the female, the only male accessible to me being one of the four examples of *pleuralis*. This male is very much smaller and narrower than the female, with the eyes better developed and separated by slightly more than twice their own width; the prothorax is more transverse and almost semicircular in outline from the base around the apex, near which it is perhaps more correctly broadly parabolic; the last ventral segment is simple, rounded to apex and not quite as long as the two preceding combined; the antennæ do not differ essentially in structure from those of the female, but are rather more slender.

BOSTRICHINI.

The genera of Bostrichini have not been considered in their mutual relationships for twenty years, when a review of them was published by Dr. Horn. I find it necessary to increase the genera recognized by

that author by five, the species hitherto placed in *Sinoxylon* being quite heterogeneous and in no single instance truly a member of that genus. *Sinoxylon dinoderoides*, *Amphicerus fortis* and *Dinoderus brevis* are also types of distinct genera. The genus proposed for the last named species is called *Patea* in the table. The genera known thus far may be thus distinguished:—

- Tarsi long, with the last joint relatively shorter, the second joint usually elongate; claws and tibial spurs stouter, grooved beneath, the edges of the groove minutely crenulate. 2
- Tarsi short, the four basal joints subequal among themselves and together nearly equal to the fifth; claws smaller and more slender, not at all crenulate within. . 9
- 2—Funicular joints of the antennæ very short and closely united, together never longer than the first joint of the club, the latter long, loose and strongly compressed 3
- Funicular joints more elongate and less closely united, together generally much longer than the first joint of the club 6
- 3—Antennal club 3-jointed 4
- Antennal club 4-jointed **Tetrapriocera**
- 4—Antennæ 10-jointed, the elytral declivity with well-marked spines or tubercles. . 5
- Antennæ 9-jointed, the elytral declivity without spines or tubercles at the sides, or with very rudimentary tuberculiform irregularities, excavated near the suture, the latter with a spiniform elevation; antennal club moderate in development, its joints decreasing in width and only very feebly serriform **Xylopertha**
- 5—Antennal club moderately developed, its first and second joints nearly similar in form; elytral declivity sexspinose **Xylobiops**
- Antennal club greatly elongated, its first and second joints dissimilar in form, the former more or less outwardly produced at apex; elytral declivity quadrituberculose. **Dendrobiella**
- 6—Joints of the antennal club strongly compressed and deeply bistriate from the apical margin; front simply tumid; hind angles of the prothorax rounded.
- Amphicerus**
- Joints of the antennal club strongly compressed but not striate, the two sensitive patches near the apices of the joints rounded and feebly marked; front lamellarly prominent behind the clypeus; hind angles of the prothorax not rounded. . **Apatides**
- Joints of the antennal club but feebly compressed and generally quite convex, the first two more or less transverse, with the two sensitive patches rounded and sub-apical; front not transversely prominent 7
- 7—Tibiæ dentate externally; claws abruptly bent at base, not distinctly crenulate; size very large **Dinapate**
- Tibiæ not dentate; claws evenly arcuate; size moderate or small. 8
- 8—Front margined at the sides; eyes well developed **Bostrichus**
- Front not margined, convex; eyes small **Micrapate**
- 9—Antennæ with the two basal joints relatively smaller, the funicle well developed; club rather short, 3-jointed.
- Antennæ 10-jointed; body elongate, the head exserted **Dinoderus**
- Antennæ 11-jointed; body short and stout; head deeply inserted **Patea**

In *Tetrapriocera* and *Putea* the antennæ are 11-jointed. In all the others they are 10-jointed, except in *Xylopertha* and in one species of *Bostrichus*, where they have but nine joints. *Tetrapriocera longicornis* (= *schwarzi* Horn) is the only known species of that genus. *Xylopertha* is confined, as might be expected, to the subsiberian fauna of the Pacific coast, where it is represented by *bidentata*, *declivis* and *suturalis*, hitherto placed in *Sinoxylon*, which genus has the two basal joints of the antennal club short and transverse. *Xylobiops* is proposed for the *Sinoxylon basillare*, *texanum*, *sextuberculatum* and *floridanum* of the present lists. *Dinapate wrighti*, the type and only known species of the genus, is the largest bostrichid known; it will probably soon become extinct by reason of the destruction of its food-plant for commercial purposes.

Dendrobiella, gen. nov.

This genus inhabits the warmer parts of the North American continent and also the West Indies; the species known to me may be identified by the following characters:—

Elytral punctures distinct throughout the disk, except at the sides, where they are obsolete, finer toward base, coarser posteriorly to the brink of the declivity, the latter smooth and impunctured as usual throughout the genus.

Larger species, 5.5–6 mm. in length, blackish in color.....**sericans** Lec.

Smaller species, 4 mm. in length, rufo-piceous in color.....**quadrispinosa** Lec.

Elytral punctures rather fine and sparse but distinct toward base, becoming wholly obsolete toward the declivity. *Male*.—Head well developed, the surface flattened, polished, nude and finely, sparsely punctulate, bituberculose at the base of the vertex; eyes moderate, very prominent; antennæ pale, longer than the width of the head, the first seven joints together scarcely longer than the first joint of the club, the tenth joint long and narrow. Prothorax wider than long, slightly narrowed anteriorly, broadly truncate at apex, the sides becoming parallel behind the middle; apical asperities moderately coarse and obtuse at the sides; disk polished, finely, subimbricately punctulate toward the middle in more than basal half. Elytra shining, the pubescence rather long, fine, decumbent, fulvous and conspicuous; apical truncature flat and shining, the tubercles moderate, the lower more obtuse. *Female*.—Smaller than the male but nearly similar, except that the head is smaller, more convex, less shining, feebly convex, punctured, pubescent and devoid of tubercles. Length 4.3–5.0 mm.; width 1.75–2.1 mm. Texas (Brownsville).....**pubescens**, sp. nov.

Elytral punctures wholly obsolete, being feebly traceable only very near the base. *Male*.—Head moderate, flattened, becoming concave behind the frontal margin. minutely, sparingly puberulent, slightly shining, finely and rather closely punctulate throughout; two small tubercles of the vertex on a transverse line through the posterior limits of the eyes; antennæ but little longer than the width of the head, nearly as in *pubescens*. Prothorax much wider than long, feebly narrowed in

apical half, very broadly truncate at apex, the apico-lateral serrules acute, about three in number; sculpture nearly as in *pubescens*, except that the disk is finely, sparsely punctulate toward base, without trace of imbricate sculpture. Elytra smooth, conspicuously pubescent; apical tubercles small and rather feeble, Length 5.0 mm.; width 2.0 mm. Island of Jamaica.....**sublævis**, sp. nov.

It is probable that *pubescens* is the species identified as *sericans* by Gorham in the "Biologia."

Amphicerus Lec.

This is a rather large and important genus among our bostrichids, not at all closely allied to *Apate* as is said to be the case by Mr. Gorham in the "Biologia," the two differing radically in the form of the antennal club among other characters. The species known to me are as follows:—

- Elytra deeply margined at apex.....2
 Elytra not strongly margined at apex, smaller species, brown or testaceous in color, with the sculpture toward the base of the pronotum less broadly granulose and more nearly strigose.....7
 2—Elytra 4-tuberculate at the summit of the apical declivity, less distinctly so in the female; body generally black throughout.....3
 Elytra bituberculate at the summit of the apical declivity, rudimentarily so in the female; color dark brown, the elytra less coarsely punctate.....6
 3—Pubescence of the elytra wanting or not distinguishable under low power.....4
 Pubescence of the elytra conspicuous but decumbent.....5
 4—Elytra of the female more elongate, distinctly more than twice as long as wide, with coarse and close-set punctures. Southern Texas to Honduras.

punctipennis Lec.

- Elytra of the female distinctly shorter, about twice as long as wide, with smaller and sparser punctures. *Female*.—Body cylindrical, black, polished and glabrous. Head two-thirds as wide as the prothorax, with the eyes rather large, very convex and prominent; vertex transversely tumid and pubescent; sculpture coarsely granulato-rugose; antennæ as long as the width of the head, dark rufopiceous. Prothorax as long as wide, parallel and broadly arcuate at the sides, narrowed and serrate at the sides anteriorly, the apex sinuato-truncate, with the apical teeth small; surface coarsely asperato-granose anteriorly, smooth with flattened contiguous tubercles posteriorly. Elytra more than twice as long as the prothorax and a little wider, the punctures coarser and closer toward the sides and strongly and coarsely confluent on the apical declivity; tubercles rudimentary. Abdomen with whitish pubescence, minutely and densely punctulate, with coarse punctures interspersed. Length 12.0 mm.; width 4.0 mm. Texas (Galveston).....**maritimus**, sp. nov.
 5—*Female*.—Body very slender, cylindrical, shining, black with a feeble piceous tinge. Head three-fourths as wide as the prothorax, the eyes very convex and prominent; vertex moderately tumid, the surface granulato rugose with a smooth

median spot posteriorly; antennæ rather stout, not quite as long as the width of the head. Prothorax obviously shorter than wide, narrowed somewhat from very near the base, more rapidly and arcuately and with moderate serrules anteriorly, the apical sinuation narrow with the teeth small; surface coarsely asperato-tuberculate anteriorly, smoother in basal two thirds, the sculpture becoming coarsely subimbricate in the middle toward base, with the surface shining and the median line finely impressed. Elytra much more than twice as long as wide, nearly three times as long as the prothorax and just visibly wider, the punctures coarse and close-set, subserial in arrangement, coarse, contiguous and subconfluent on the declivity, the tubercles feeble, especially the inner. Abdomen finely punctulate, pubescent, the scattered larger punctures rather small. Legs quite slender. Length 9.0 mm.; width 2.5 mm. Kansas, Iowa and North Carolina. **gracilis**, sp. nov.

6—Tubescence distinct, decumbent. Sutural series rather impressed, the suture elevated on the declivity. Head rather small, the eyes moderate in size. Elytral punctures not serial in arrangement, but with traces of three fine raised lines. Indiana and Kansas **bicaudatus** Say.

7—Prothorax emarginate at apex, fully as long as wide and with the usual terminal teeth of the lateral series. *Male*.—Rather stout, cylindrical, shining, dark testaceous-brown in color; antennæ pale; surface virtually glabrous. Head moderate, nearly two-thirds as wide as the prothorax, broadly, almost evenly convex, with a large median impunctate area; transverse impression behind the clypeus deep and distinct; eyes small and but moderately prominent; antennæ fully as long as the width of the head. Prothorax fully as long as wide, the sides broadly arcuate, becoming parallel only very near the base, converging anteriorly where the serrules are prominent and close-set in less than apical half; apex narrowly sinuate, surface tuberculose anteriorly, becoming smooth and polished in basal half and almost sculptureless toward the sides but sparsely imbricato-strigose toward the middle. Elytra short, one-half longer than wide, equal in width to the prothorax, strongly but not very closely, confusedly punctate, more closely but scarcely coalescently behind, the declivity very steep, more convex at each side above but not tuberculate, the suture elevated. Abdomen finely, strongly and densely punctulate, the scattered coarser punctures not visible, the pubescence even, decumbent and rather dense; last segment shorter than any of the preceding. Hind tarsi very much longer than the tibiæ. Length 6.7 mm; width 2.2 mm. Texas (El Paso) **grandicollis**, sp. nov.

Prothorax truncate at tip, with the angles obtuse and rounded, without trace of processes 8

8—Larger species, the prothorax much wider than long and trapezoidal in form; *Female*.—Rather slender, cylindrical, shining, subglabrous, dark rufo-testaceous in color. Head well developed, nearly three-fourths as wide as the prothorax, the surface granose throughout, tumid posteriorly, the epistomal suture just beyond the middle of the length and impressed toward the middle, the epistoma large; eyes very large, convex and prominent; antennæ obviously shorter than the width of the head, with the club relatively very long, the five joints of the funicle together barely equal in length to its first joint. Prothorax much wider than long, the sides parallel and feebly arcuate nearly to the middle, then

strongly convergent to the truncate apex, the latter not visible from above but narrow and feebly sinuate; declivity coarsely asperate above, smoother near the apex, subserrate laterally, the teeth not extending to the apex; basal half rather dull in lustre and with short strigiform lines not densely placed. Elytra about twice as long as wide, between two and three times as long as the prothorax and rather wider, rather coarsely, deeply and irregularly but uniformly and quite densely punctate, very densely and perforately so behind, the declivity moderately steep, more convex at each side but not tuberculate, the suture elevated. Abdomen closely punctulate, the pubescence moderately abundant. Tarsi very long. Length 6.5-7.0 mm.; width 2.0-2.2 mm. Texas (El Paso).

brevicollis, sp. nov.

Small species, 4.5-5.5 mm. in length, the prothorax as broad as long. Body elongate, cylindrical, sparsely clothed with moderately long semi-erect hair; elytra coarsely and seriatly punctate; under surface sparsely punctate. California (Fort Yuma) **teres** Horn

Grandicollis is described from what appears to be the male, but the eyes are very small when compared with those of *brevicollis*, of which the four homogeneous examples before me seem to be females; both of these species and probably *teres* also, which I have not seen, have the funicle of the antennæ much shorter than in the others; in *grandicollis* the five joints together are however quite distinctly longer than the first joint of the club; in *brevicollis* they are barely as long as the first joint but do not have the closely crowded structure observed in *Sinoxylon* and *Tetrapriocera*. In *brevicollis* there are a few erect hairs observable near the sides of the elytra especially behind, but otherwise the surface is glabrous and the punctures are only feebly subseriate in arrangement.

Apatides, gen. nov.

This genus is amply distinct from *Amphicerus* in the characters of the table. We have the following three species:—

Inner margin of the epipleuræ continuous and obliquely ascending at base to the humeral angles in the female; basal angles of the prothorax acute and prominent; head and abdomen finely punctate, the former slightly tumid or subcarinate along the middle toward the frontal margin. Lower California and California (Yuma) **fortis** Lec.

Inner margin of the epipleuræ discontinuous at base in the female, basal angles of the prothorax not at all rounded but at the same time not distinctly prominent, the surface less impressed before the angles. 2

2—Vertex gradually ascending to the prominent frontal margin, finely and sparsely punctate, the abdomen minutely punctulate throughout; thoracic processes separated by rather more than a third of the total width. *Male*.—Head three-fifths as wide as the prothorax, the latter nearly as long as wide, with the

apical processes long and obliquely convergent; surface with the usual isolated tubercles toward base. Elytra twice as long as wide, just visibly wider than the prothorax, the apical declivity flattened, becoming alutaceous in lustre and almost impunctate toward the suture, which is elevated. *Female*.—Similar to the male but larger, with the thoracic processes short and parallel, the elytra rather more than twice as long as wide and more distinctly wider than the prothorax, the apical declivity convex and coarsely perforato-punctate throughout, the suture moderately elevated. Length 13.0–15.5 mm.; width 4.3–5.1 mm. Texas (El Paso).....**robustus**, sp. nov.

Vertex more tumid and convex, less finely and quite strongly punctured throughout; abdomen strongly though sparsely punctured toward base; thoracic processes more approximate, separated by but little more than a fourth of the total width. *Female*.—Head moderate in size, the eyes very convex and prominent as usual. Prothorax not quite as long as wide, nearly as in *robustus* but less devoid of sculpture toward the basal angles. Elytra not at all more than twice as long as wide, the apical declivity rather more convex at each side than in *robustus*, steeper and a little less coarsely punctured. Abdomen polished as usual, the punctures becoming finer and denser toward apex. Length 12.5 mm.; width 4.3 mm. Arizona (Locality not specified—Levette Cabinet.)

puncticeps, sp. nov.

The male of *fortis* has the apical processes more convergent and longer than the female, but there seems to be no modification of the elytral declivity near the suture. Individuals vary much in size as usual in the Bostrichinæ.

Bostrichus Geoff.

The genus *Bostrichus*, as represented in America, differs remarkably from *Amphicerus* in the structure of the antennal club, the joints being short, subglobose, and with the sensitive spaces small and circular; it also differs in having the basal angles of the prothorax acute and prominent, but in that respect resembles *Apatides*, from which it differs in turn in the structure of the antennal club and frontal parts of the head. The following table comprises all the species known to me at present:—

- | | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| Prothorax narrowly and deeply sinuate at apex, with the limiting processes prominent and generally uniform; elytra each with two ridges more or less distinct or interrupted..... | 2 |
| Prothorax sinuato-truncate at apex, with the limiting angles acute and somewhat prominent; vestiture hair-like, decumbent and unevenly distributed; elytra without trace of ridges; species smaller and more slender | 5 |
| 2—Hind tarsi fully as long as the tibiæ; uniform processes of the prothorax more prominent. Atlantic regions..... | 3 |
| Hind tarsi shorter than the tibiæ; uniform processes shorter, not differing in form from the lateral serrules.... | 4 |

- 3—Vestiture of the elytra squamiform; inner ridge strong and continuous to the apical declivity **bicornis** Web.
 Vestiture more hair-like and still more unevenly disposed in clusters; inner ridge feeble and much interrupted, the outer almost obsolete **armiger** Lec.
 4—Elytral vestiture long and hair-like, very sparse and almost evenly disposed; ridges fine, feeble and subobsolete **californicus** Horn
 5—Antennæ 10-jointed as usual **truncaticollis** Lec.
 Antennæ 9-jointed. Evenly cylindrical, black, the antennæ and tarsi paler; vestiture coarsely hair-like, fulvous in color, dense and conspicuous, somewhat uneven on the elytra but much less nucleated than in *truncaticollis*. Head moderate, opaque, pubescent, the eyes well developed; antennæ as long as the width of the head, the funicle 4-jointed. Prothorax nearly as long as wide, roughly tuberculose, pubescent, the basal angles acutely prominent; median line somewhat depressed. Elytra slightly wider than the prothorax, two and one-half times as long as wide, coarsely, densely, unevenly punctured and finely tuberculose. Legs rather short and slender, the hind tarsi longer than the tibiae. Length 6.4 mm.; width 1.8 mm. New Jersey (Woodbury).

angustus, sp. nov.

In the males the elytral apices are minutely spinulose throughout, but there is very little sexual difference otherwise, except that the male is generally smaller and with the elytra less elongate. It will probably prove necessary to generically separate the American species of *Bostrichus* from the European forms, when the family is monographed as a whole.

Micrapate, gen. nov.

This genus is founded upon the *Sinoxylon dinoderoides* of Horn, and its allied species, and I have ventured to include also the *S. simplex* of that author, although the size is so much greater that renewed observation would possibly disclose some divergencies of a generic nature. I should have been disposed to refer the specimens described above under the name *Amphicerus brevicollis* to *S. simplex*, were it not for the fact that the basal parts of the pronotum are said to be "densely punctate," which language it would be impossible to apply to *brevicollis*, where the sculpture of that part consists of short, isolated and longitudinal raised lines, as in the *Amphicerus teres* of Horn. It is a peculiarity of *Micrapate* that the basal parts of the pronotum are truly and simply punctate, and not in any way asperate, granose or tuberculose. Our species are as follows:—

- Pronotum less densely or rather sparsely punctured toward base; size much smaller, never materially exceeding 4 mm. in length.....2
 Pronotum densely punctate toward base.....3
 2—Surface "feebly shining;" suture moderately and evenly elevated on the apical declivity. Arizona and Texas (Brownsville) **dinoderoides** Horn

Surface strongly shining; sutural elevation on the declivity strong, its summit for a short distance at the middle of the declivity, still more elevated, dilated and canaliculate. *Female*.—Similar to *dinoderoides* but smaller, the epistomal suture more deeply impressed and more remote from the apical margin. Prothorax nearly as long as wide, similar to *dinoderoides* but still more sparsely punctate toward base. Elytra rather coarsely, strongly punctured and very densely so, the punctures rather sparser toward the suture except on the declivity, but not as sparse as in *dinoderoides*, the surface unevenly rugose by anteriorly oblique light. Under surface finely and densely punctulate, confluent so on the sterna. Length 3.4 mm.; width 1.15 mm. District of Columbia**cristicauda**, sp. nov.

3—Size larger, 6.5 mm. in length. Body piceous, the elytra brownish; head opaque, tuberculate, the maxillary palpi with the last two joints equal; prothorax wider than long; elytra not wider than the prothorax, very coarsely and closely punctate, the punctures of the declivity coarser and denser, the sutural region slightly elevated, especially in the apical declivity. Body beneath moderately densely punctate, sparsely pubescent. Texas (southwestern)**simplex** Horn

I have here regarded the specimens recently taken by Mr. Wickham in the extreme southern part of Texas, near Brownsville, as representing the true *dinoderoides*, but actual comparison will be necessary to decide, as these examples are certainly strongly shining.

Dinoderus Steph.

The rather numerous species of this genus may be outlined in the table which follows. *Punctatus* and *truncatus* are the only discordant elements after eliminating *brevis*, and they may have to be separated at some future time.

- Apex of the elytra convex, the suture only very rarely somewhat prominent, the apical margin not concave or prominently margined; pubescence erect. 2
 Apex of the elytra more abruptly truncate, concave and prominently margined at tip; pubescence decumbent. 13
 2—Pronotum with granuliform and separated tubercles toward base. 3
 Pronotum with flattened and generally subcontiguous tubercles toward base; side margins almost devoid of serrulation except at apex; body more cylindro-convex 8
 3—Elytra polished or strongly shining. 4
 Elytra opaque; color dark brown or blackish-piceous. 5
 4—Elytra with very close-set perforate punctures, larger than the width of the intervals, the latter tuberculose; color dark brown throughout. Michigan, Canada and Europe. **substriatus** Payk.
 Elytra with less coarse and impressed punctures, not larger than the width of the intervals, the latter less elevated and more feebly but distinctly tuberculose; color black or blackish. Head moderate, exerted, with a polished constriction at base as usual; surface subopaque, granulose, the epistomal suture distinct; apex sinuate; eyes small, convex; antennæ stout, dark rufous, not as long as the

width of the head. Prothorax not quite as long as wide, the apex broadly arcuate, the sides becoming parallel and feebly arcuate near the base, serrate throughout, rather strongly at the rounded basal angles and still more coarsely around the apex; base broadly lobed; surface with small, strong and isolated granules throughout, intermingled anteriorly with some larger sparse asperities. Scutellum small. Elytra not quite twice as long as wide, more than twice as long as the prothorax and slightly wider; surface with series of moderately coarse punctures, confused near the suture and smaller and less seriate on the flanks; intervals asperate; apex evenly convex, with the punctures confused and asperate. Abdomen shining, sparsely punctulato-rugose and finely, sparsely pubescent. Length 4.0-4.8 mm; width 1.3-1.6 mm. California (Calaveras Co.), Colorado and Idaho (Cœur d'Alène).....**pacificus**, sp. nov.

Elytra with less coarse and more impressed punctures, nearly as in *pacificus* and not larger than the width of the intervals, the latter perfectly even, polished and devoid of tubercles or asperities throughout. Body deep black, the erect hairs of the elytra rather short. Head dull, sparsely pubescent, the epistoma broadly sinuate. Prothorax not quite as long as wide, arcuately swollen toward base, broadly rounded and asperato-tuberculose at apex; disk granose toward base. Elytra slightly wider than the prothorax, rather short, four-fifths longer than wide, the punctures seriate in arrangement, densely confused near the suture, more broadly toward base, small and irregular in arrangement toward the side margins, the apical declivity evenly convex and not at all granulose though more closely and unevenly punctate. Abdomen shining, sparsely punctulate. Length 2.7-3.7 mm.; width 0.8-1.2 mm. Wyoming (Laramie) and Arizona.

sobrinus, sp. nov.

5—Elytral granules strong and well defined, arranged in even single series along the intervals.....6

Elytral granules subobsolete except on the declivity, the punctured series contiguous, with the intervening ridges narrow and alternately slightly stronger.....7

6—Elytra roughly and densely punctate on the declivity, the tuberculose intervals equal throughout, finely and confusedly on the flanks. Head short and transverse, granose, the basal constriction exposed as usual; eyes small; antennæ short, the club paler; epistomal suture subobsolete. Prothorax slightly shorter than wide, nearly as in *pacificus*. Elytra not quite twice as long as wide, rather wider than the prothorax, the lustre dull, the sculpture coarse and rough, the punctures of the series large, deep and approximate but circular and well defined, except at the sides. Abdomen minutely, sparsely punctulate, feebly pubescent. Length 4.0 mm.; width 1.4 mm. New Mexico (Fort Wingate)...**asperulus**, sp. nov.

Elytra finely, evenly and strongly granose on the declivity; intervals separating the punctured series equal in elevation; punctures of the series coalescent and not well defined. Head short and transverse, finely granose, the labrum declivous, the eyes and antennæ moderate. Prothorax not quite as long as wide, broadly rounded and strongly asperate anteriorly, the sides feebly diverging to the rounded and asperate basal angles; disk with the granules equal, strong and isolated toward base. Elytra but little wider than the prothorax, scarcely twice as long as wide, densely sculptured in even series, except near the suture and

- more broadly on the flanks, the elevations polished. Length 5.2 mm.; width 1.6 mm. Arizona (Seligman)... ..**amplus**, sp. nov.
- Elytra rather sparsely and strongly granose on the declivity; intervals separating the punctured series alternating in prominence; punctures of the series subtransverse, subcoalescent and not well defined. North Carolina...**porcatus** Lec.
- 7—Punctures of the elytral series confluent, opaque and not well defined. Head transverse, opaque and granulose; eyes small; antennæ short, dark rufous, the club not paler. Prothorax nearly as in *pacificus*, the basal angles less rounded. Elytra about twice as long as wide, slightly wider than the prothorax and much more than twice as long; sculpture very dense, the surface densely opaque; erect hairs moderate in length, stiff and fulvous. Abdomen rather dull, finely, sparsely punctulate. Length 3.0–4.0 mm.; width 0.9–1.2 mm. Virginia (Norfolk)... ..**opacus**, sp. nov.
- 8—Elytral punctures confused in arrangement, at least toward the sides and suture. 9 Elytral punctures forming perfectly even series throughout the width, the intervals even... ..12
- 9—Apical declivity of the elytra granulose, the punctures more close-set throughout. 10 Apical declivity simply punctate... ..11
- 10—Elytral punctures distinctly asperate throughout. Body and legs blackish, the antennæ rufo-piceous; surface moderately shining. Head short, not very densely granose. Prothorax not quite as long as wide, the sides feebly convergent from near the broadly rounded basal angles, merging gradually into the broadly rounded and moderately serrulate apex; surface sparsely, rather strongly asperate anteriorly, more closely granulate toward base, the granules flattened, less dense laterally. Elytra about two-thirds longer than wide, twice as long as the prothorax and scarcely wider; punctures not very coarse, serial in arrangement, the intervals flat and even; apex evenly convex, strongly granotuberculose. Abdomen shining, sparsely punctulate. Length 3.7 mm.; width 1.2 mm. New Jersey... ..**hispidulus**, sp. nov.
- Elytral punctures circular, not asperate on the disk and toward the suture, feebly granuliferous on the convex declivity; elytra polished, the intervals flat; serial arrangement of the punctures only observable along the middle of each elytron. South Carolina... ..**densus** Lec.
- Elytral punctures abnormal, not rounded but somewhat dilated at their posterior limits, serial in arrangement and well separated, more confused near the suture and broadly toward the sides, not granulose except posteriorly and on the declivity. Body evenly cylindrical, shining, dark piceous, the elytral vestiture sparse, stiff and erect. Head nearly smooth, constricted at base as usual. Prothorax nearly as long as wide, oval, asperulate anteriorly, the basal angles rounded; disk with the flattened and nearly contiguous tubercles toward base small. Elytra perfectly cylindrical, barely twice as long as the prothorax and perceptibly wider, not quite twice as long as wide, polished. Length 2.4 mm.; width 0.7 mm. Pennsylvania... ..**parvulus**, sp. nov.
- 11—Dark rufo-piceous, the elytra blackish, highly polished with rather small and simple punctures, which are only feebly subserial in arrangement, becoming very small and feebler on the flanks and simple on the declivity. Indiana and South Carolina... ..**cribratus** Lec.

- 12—Body small, narrow, subglabrous, highly polished and pale rufo-testaceous throughout; apical margin of the prothorax rather crenulate than serrulate. Iowa (Keokuk). Cosmopolitan and introduced.....***pusillus* Fabr.**
- 13—Antennæ with the second joint nearly as slender as the third, the funicle bristling with long coarse hairs anteriorly; ridge of the apical declivity short; head strongly, transversely tumid behind the epistoma. New York, Indiana and South Carolina.....***punctatus* Say**
- Antennæ with the second joint stout, the funicle not more setose in front; declivity more abrupt and flat, with the marginal ridge long. California.

***truncatus* Horn**

I have not been able to compare *substriatus** of the table with European examples, and the identification is taken from the books; it is referred to the genus *Stephanopachys* by Heyden, Reitter and Weise, who separate also *pusillus* under the generic name *Rhizopertha* (*Rhyzopertha*). The differences seem to be scarcely generic in value. *Truncatus* of Horn, I have not seen.

CIOIDÆ.

The Cioidæ are intimately related to the Bostrichinæ, as shown by general organization, and particularly by the two small rounded sensitive areas near the apices of the joints of the antennal club, greatly developed in the genus *Plesiocis*; but, at the same time, they are closely allied also to some groups at present assigned to the Clavicornia, such as the Cryptophagidæ and Mycetophagidæ. In fact, the assemblages which are at present collectively known as the Clavicornia, are so heterogeneous among themselves as to indicate that they do not form a natural division of the Coleoptera at all, but are in many cases the extreme developments of various types of Serricornia or Adephaga, and the Heteromera belong near them in immediate succession. *Berginus* has a purely serricorn habitus, and yet has been placed with the Mycetophagidæ. I believe that the Cryptophagidæ and Mycetophagidæ should not be widely separated from Cioidæ and Sphindidæ, and I am in favor of removing them from the so-called Clavicornia and placing them in the Serricornia near Cioidæ. This would be far more natural than to remove the Cioidæ to the Clavicornia. The Cucujidæ, consisting of the subfamilies Passandrinæ, Colydiinæ, Monotominæ, Rhyssodinae, Lyctinæ, Silvaninæ, Brontinæ, Cucujinæ and Hemipeplinæ should also be removed from the Clavicornia and follow Cioidæ, Cryptophagidæ, etc., in the Serricornia. The Hemipeplinæ form a natural transition to the Heteromera.

* *Dinoderus substriatus* is said by Mannerheim (Bull. Mosc., 1853, p. 233), to inhabit also the Kerai Peninsula, in Alaska.

The Cioidæ consist of two subfamilies, Cioinæ and Rhipidandrinæ, distinguished by clavate and compactly serrate antennæ respectively. The American genera of Cioinæ are as follows:—

- Antennæ 10-jointed2
 Antennæ 9-jointed.....7
 Antennæ 8-jointed; body glabrous.....8
 2—Prosternum well developed before the coxæ; lateral edges of the prothorax acute to the apex3
 Prosternum very short and transversely excavated before the coxæ; lateral edges of the prothorax becoming subobsolete at the apex6
 3—The prosternum simple or nearly so.....4
 The prosternum tumid or carinate along the middle5
 4—Body setose or pubescent the vestiture erect and bristling, the anterior tibiæ finely produced and dentiform externally at apex, sometimes simple **Cis**
 Body glabrous, the anterior tibiæ wholly unarmed at apex; elytral suture margined toward tip; body elongate, the head rather less deflexed than usual, the head and prothorax simple in the male, the latter with a deep rounded setigerous fovea at the centre of the first ventral segment..... **Orthocis**
 5—Body glabrous or with very short decumbent pubescence or inclined setæ.
Xestocis
 6—Body very short, oblong-oval in form, with stiff erect pubescence as in *Cis*.
Brachycis
 7—Body stout, convex, coarsely cribrate and setose; anterior tibiæ strongly, obliquely produced and acute externally at apex..... **Plesiocis**
 Body narrow, cylindrical, feebly sculptured and glabrous, the anterior tibiæ thickened and externally rounded and spinulose at apex..... **Ennearthron**
 8—Anterior tibiæ swollen, rounded and spinulose externally at apex as in *Ennearthron*; head and prothorax strongly modified in the male..... **Ceracis**
 Anterior tibiæ narrowly triangular, the external edge straight throughout and minutely spinulose; head and prothorax not modified in the male. . **Octotemnus**

The term glabrous, as used above, signifies the absence of distinct pubescence; with high power each puncture can be seen to bear a very small hair. Many of Mellié's species are still unknown to me, and the localities of some of them may be open to doubt; a few may possibly be synonyms, as, for example, *atripennis*, which may have been founded upon a damaged specimen of *fuscipes*. It is possible that the *Cis pumicatus* of Mellié may prove to be an *Octotemnus*. *Ceracis* is very closely allied to *Ennearthron*, and was indeed considered to be more properly a subgenus by Mellié. The figure of *C. sallei*, on plate 4 of the monograph, seems to have been taken from a specimen of *Ennearthron melliéi*.*

* I am indebted for several very interesting species of Cioidæ to my friend, P. Jerome Schnitt, of Westmoreland county, Pa., and Mr. Wickham has also contributed a number of interesting species in Bostrichinæ, Cioidæ and Sphindidæ.

Cis Latr.

Only those species represented before me are included in the following table:—

- Elytra with shallow, variolate and nude punctures, intermingled with others smaller and deeper which bear the setæ. 2
- Elytra deeply punctured throughout, all the punctures bearing hairs or setæ. 11
- 2—Body stout and convex, the elytra confusedly rugulose; maxillary palpi very stout; anterior tibiæ acute and feebly everted externally at tip; apical angles of the prothorax right and somewhat prominent, the apex prolonged and broadly rounded over the head; base not distinctly margined. 3
- Body narrowly elongate oval and more depressed, the surface less rugose but with the elytral series more distinct; maxillary palpi variable but generally less stout; antennal club smaller, with the two basal joints wider than long; apical angles of the prothorax obtuse, the apex broadly, evenly rounded over the basal parts of the head, the base finely margined; scutellum transversely oval. 8
- 3—Elytral bristles moderate in length, more or less distinctly serial in arrangement, the antennal club long and loose, with the two basal joints as long as wide; head and pronotum finely, evenly punctured, the elytral punctures fine, not very distinct and rather sparse; male sexual characters very feeble. 4
- Elytral bristles extremely short, distributed uniformly but without order; antennal club shorter, with the two basal joints wider than long; male characters pronounced. 7
- 4—Third and fourth joints of the antennæ elongate and equal, each as long as the fifth and sixth together. Body stout, shining, castaneous in color, the head moderate, with the clypeal margin feebly reflexed and broadly subtruncate; eyes rather well developed; prothorax distinctly wider than long, the sides reflexed, feebly convergent and feebly, evenly arcuate from the obtuse basal angles to the apex; elytra one-half longer than wide, twice as long as the prothorax and just visibly wider. Length 2.4–2.8 mm.; width 1.05–1.25 mm. North Carolina (Asheville) **carolinæ**, sp. nov.
- Third joint much longer than the fourth, the latter distinctly shorter than the fifth and sixth combined. 5
- 5—Concave side margin of the pronotum not at all inwardly prolonged at base; body large, generally pale in color, shining; prothorax more than one-half wider than long, the basal angles very obtuse and rounded; sides slightly convergent and very feebly, evenly arcuate throughout; elytra barely one half longer than wide, nearly two and one-half times as long as the prothorax and slightly wider, the humeral callus small but pronounced. Length 2.8–3.0 mm.; width 1.1–1.3 mm. Montana (Missoula) **pallens**, sp. nov.
- Concave margin more or less distinctly prolonged inwardly at base; color black or piceous-black, the size smaller. 6
- 6—Male with the prothorax simple throughout. Atlantic regions, from Massachusetts to Iowa and Texas (Houston) **fuscipes** *Mell.*
- Male with the prothorax broadly impressed at apex. Body moderately stout, strongly convex, blackish in color and shining, the elytral punctures generally stronger

than those of the pronotum, with the impressed lines distinct; head with the clypeal margin moderately reflexed and broadly sinuato-truncate in both sexes; prothorax two-fifths wider than long, the sides feebly convergent, rather more rounded near the base; elytra one-half longer than wide, fully twice as long as the prothorax and just visibly wider posteriorly. Length 1.8–2.75 mm.; width 0.8–1.2 mm. Pacific coast—Vancouver Island, Washington State (Tacoma) and California (Humboldt Co. and Alameda)..... **impressa**, sp. nov.

7—Body rather stout, strongly convex, oblong-suboval, shining, blackish in color throughout, the legs and antennæ dark rufous; vestiture very short and almost scale-like, erect as usual; head moderate, the eyes well developed, convex and prominent; prothorax one half to three-fifths wider than long, the sides rather widely reflexed, slightly convergent and broadly, evenly arcuate throughout, the basal angles very obtuse; surface finely, closely punctured but polished; elytra more than one-half longer than wide, nearly two and one-half times as long as the prothorax and very slightly wider, the humeral callus small; surface confusedly rugulose, finely punctate and with slightly evident longitudinal lines and short transverse rugæ. *Male*.—Head concave, the clypeal margin reflexed and broadly bidentate; prothorax impressed transversely at the apical margin, the latter moderately reflexed, with a small rounded sinuation at the middle. *Female*.—Head flat, the clypeal margin very slightly reflexed, broadly, feebly sinuato-truncate, the prothorax rounded and unmodified at apex. Length 2.2–2.5 mm.; width 0.9–1.1 mm. Rhode Island (Boston Neck)..... **pistoria**, sp. nov.

8—Anterior tibiæ finely everted and acute externally at apex.....9

Anterior tibiæ simple at apex10

9—Pronotum not impressed at the apical angles, the flanks deeper, the side margin feebly reflexed, more strongly about the basal angles. *Female*.—Body elongate-oval, moderately convex, piceous, the elytra black; legs and antennæ paler, rufous, shining, the bristles short and pale, moderately abundant, not arranged in definite series on the elytra though with feeble suggestion of such arrangement at certain parts; head moderate, the eyes small, the clypeal margin broadly arcuate; prothorax nearly as long as wide, circularly arcuate in apical third, the sides thence nearly straight and parallel to the basal angles, which are very obtuse; base arcuate; punctures rather fine, strong and close-set; elytra three-fourths longer than wide, two and one-third times as long as the prothorax and scarcely wider; punctures fine, strong, close-set, the impressed lines distinct and with rather coarser irregular punctation. Length 2.3 mm.; width 0.8 mm. Colorado (Salida)..... **striolata**, sp. nov.

Pronotum impressed at the apical angles, the side margins strongly, narrowly and equally reflexed throughout. *Female*.—Nearly similar to *striolata* but shorter, the prothorax fully one third wider than long, with the sides subparallel, evenly and feebly arcuate throughout, the apex broadly, evenly arcuate; punctures fine, strong and rather close-set; elytra two-thirds longer than wide, two and one-half times as long as the prothorax, the surface polished, with distinctly impressed lines of much coarser punctures, which are shallow, nude and variolate as usual, the bristles arranged more definitely in series. *Male*.—Smaller than the female and more slender, the clypeal margin rather strongly rounded near the eyes and remotely and feebly bituberculate at the middle; prothorax only slightly shorter

than wide, the sides feebly convergent and evenly and feebly arcuate from the base, the apex circularly rounded, the surface dull; elytra polished, nearly as in the female; first ventral segment foveate at the centre. Length 2.0–2.2 mm.; width 0.65–0.75 mm. Utah (southwestern).....**fraterna**, sp. nov.

- 10—Body more slender, piceous black throughout. *Female*.—Narrowly elongate-oval, moderately convex, shining; legs and antennæ rufous; bristles short, pale as usual, arranged in almost regular series on the elytra; front feebly convex; eyes moderate in size; clypeus broadly arcuate, very short before the eyes; prothorax nearly one-third wider than long, the sides feebly convergent, evenly and feebly arcuate from base to the rather pronounced apical angles, which are not rounded, the apex circularly arcuate, the punctures fine but deep, moderately close; elytra two-thirds longer than wide, nearly two and one-half times as long as the prothorax and somewhat wider, the humeral callus minute; series well impressed, almost regular but not much more coarsely punctate, the intervals sparsely punctulate. Length 1.9 mm; width 0.7 mm. California (Lake Tahoe);

macilenta, sp. nov.

- Body stouter and more cylindric, bicolored, the head and prothorax rufous, the elytra black. *Female*.—Oblong-subcylindric, moderately convex, slightly dull in lustre; bristles short, feebly subserial on the elytra; head feebly convex, the clypeus broadly arcuate-truncate, oblique at the sides to the eyes, which are small; prothorax fully one-third wider than long, nearly as in *macilenta*, the basal angles more broadly rounded; elytra scarcely more than one-half longer than wide, but little more than twice as long as the prothorax and not wider, the impressed lines feeble and somewhat irregular, more coarsely punctured. Length 1.4–1.8 mm.; width 0.55–0.75 mm. California (Calaveras, Humboldt, Lake and Los Angeles Cos.).....**versicolor**, sp. nov.

- 11—Vestiture of the elytra stiff and bristle-like12

- Vestiture of the elytra long, slender and hair-like but erect and conspicuous; elytral punctures arranged without order, not at all seriate at any point; last joint of the maxillary palpi acutely pointed.....25

- 12—Vestiture more or less distinctly serial in arrangement13

- Vestiture not at all serial at any point, the punctures evenly distributed.....15

- 13—Body strongly cylindro-convex, the elytral punctures differing among themselves in size, the larger forming more or less indefinite series; bristles unusually long14

- Body narrow, parallel, distinctly depressed, the punctuation dense, the elytral punctures more uniform in size, the bristles moderate in length, forming close and nearly even series. Pennsylvania to Texas**creberrima** *Mell.*

- 14—Sides of the prothorax becoming straight and parallel behind the middle. *Male*.

—Body subcylindric, somewhat shining, castaneous in color, the bristles coarse, erect, longer than the width of the scutellum, subserial on the elytra; head moderate, the front flat, the eyes small; clypeal margin feebly reflexed, remotely and feebly bituberculate, a small sinus just without each tubercle and thence strongly oblique for some distance to the eyes; prothorax nearly as long as wide, circularly rounded at apex, narrowly subsinuate at the middle; angles obtuse; base finely margined; surface very obsoletely, transversely impressed at apex; punctures uneven in size, small, deep; not very close-set; scutellum pointed behind;

elytra two-thirds longer than wide, equal in width to the prothorax and barely twice as long, obtuse at apex; series of coarse punctures scarcely impressed. *Female*.—Nearly similar to the male, the clypeal margin evenly arcuate-truncate, the prothorax not modified. Length 2.4–2.9 mm.; width 0.9–1.1 mm. Utah (southwestern)..... **mormonica**, sp. nov.

Sides of the prothorax subparallel and evenly arcuate throughout. *Male*.—Similar to *mormonica* in the modifications of the clypeus and prothorax, pale piceous, polished, the bristles long, stiff and erect, subserial on the elytra; eyes small; prothorax fully one-third wider than long, the angles obtuse; punctures moderately fine, deep, somewhat uneven in size, rather close-set; elytra less than twice as long as wide, as wide as the prothorax and barely twice as long; punctures rather coarse and close-set, the larger only partially forming indefinite and scarcely at all impressed series. Length 2.0 mm.; width 0.85 mm. Pennsylvania (Westmoreland Co.)..... **horridula**, sp. nov.

15—Body obese and strongly convex, suboval; male sexual characters pronounced, the female also having the apex of the prothorax at least feebly bilobed; apical angles of the anterior tibiæ everted and acute externally.....16

Body subcylindric, convex; male sexual characters feeble, the clypeus finely bituberculate; maxillary palpi slender; prothorax margined at base, the angles obtuse.....21

16—Clypeus angulate at each side near the eyes in both sexes.....17

Clypeus emarginate in the middle and bidentate, not angulate near the eyes.....20

17—Elytra very nearly one-half longer than wide.....18

Elytra very short, scarcely one-third longer than wide.....19

18—Elytral punctures rather close-set. *Male* with the clypeal margin reflexed and quadridentate, the apex of the prothorax with two broad porrect triangular processes, separated by a rounded sinuation. California..... **vitula** Mann.

Elytral punctures rather sparse, the integuments more shining. *Female*.—Body elongate-oval, very convex, polished, castaneous, the legs, antennæ and sometimes the anterior parts paler; bristles of the prothorax very small and rather fine, not conspicuous, of the elytra coarse, moderately long and rather sparse; head concave apically, the clypeus broadly rounded and obscurely quadrangulate; eyes rather small; prothorax one-fourth wider than long, the sides feebly convergent and very feebly, evenly arcuate from base to the rather obtuse but somewhat prominent apical angles; base transverse, very feebly lobed at the middle, very finely margined; apex advanced, rounded and feebly bilobed; punctures fine and moderately close; scutellum obtuse, wider than long; elytra as wide as the prothorax and slightly less than twice as long, perfectly even, the punctures deep, very much larger than those of the pronotum. Length 2.3–2.5 mm.; width 1.15 mm. California (Humboldt Co.)..... **illustris**, sp. nov.

19—*Female*.—Body stout, oval, strongly convex, pale in color, polished, the elytral bristles very short, those of the prothorax rather inconspicuous; head nearly as in *illustris*, less concave anteriorly, the eyes very small; prothorax nearly as in *illustris* but shorter, nearly one-half wider than long, the punctures very small and rather sparse; surface occasionally with a very obsolete median canaliculation near the apex; elytra very short, scarcely two-thirds longer than the prothorax, strongly convex, obtusely rounded behind, the punctures rather

coarse but feebly impressed and quite sparse. Length 2.1 mm.; width 1.0 mm. Louisiana **congesta**, sp. nov.

- 20—*Male*.—Cylindric-oval, not very stout, strongly convex, pale in color probably from immaturity, rufo-testaceous, shining; bristles very stout but short, distinct and rather close on the prothorax, somewhat sparse on the elytra; head and eyes rather well developed, the front flat; clypeus strongly reflexed, triangularly bidentate; prothorax two-fifths wider than long, the sides rather strongly convergent and arcuate from base to apex, the latter reflexed and triangularly bidentate; base truncate; punctures quite coarse, deep and close-set; elytra less than one-half longer than wide, four-fifths longer than the prothorax, the punctures about equal in size to those of the pronotum but sparser. Length 1.4 mm.; width 0.6 mm. California.....**duplex**, sp. nov.

- 21—Prosternum normally convex; anterior tibiae externally everted and acute at apex; scutellum small, not wider than long; prothorax rounded at the apex; male with the first ventral simple. *Male*.—Body narrowly cylindric-oval, moderately convex, piceous-black, with the legs and antennae pale; surface shining; bristles coarse, pale, erect, moderately sparse, even in length on the elytra; head and eyes small; clypeal margin feebly reflexed, bituberculate; prothorax nearly as long as wide, parabolically rounded anteriorly, with a small and very feeble median sinuation, the sides becoming straight and parallel toward base; punctures fine but perforate, rather close-set; elytra rather more than one-half longer than wide, as wide as the prothorax and twice as long, the punctures rather coarse, well separated and subeven in size. Length 2.0 mm.; width 0.7 mm. California (Lake Tahoe).....**hystricula**, sp. nov.

Prosternum broadly and feebly biconcave; anterior tibiae thickened and rounded externally at apex; scutellum larger; prothorax feebly sinuate from above at the converging sides of the apex; maxillary palpi with the last joint more acutely pointed; male with the first ventral foveate at the middle.....22

- 22—Eyes small, the body more elongate and cylindric.....23

- Eyes large and well developed; body stouter and more cylindric-oval.....24

- 23—Antennal funicle longer than the club. *Male*.—Moderately convex and shining, rather pale castaneous, the bristles stiff, moderately long and rather abundant; head rather well developed, the clypeal tubercles small and separated by a fourth of the entire width; prothorax nearly a fourth wider than long, rounded and somewhat lobed at apex, the sides becoming nearly straight and parallel toward base; punctures rather strong and close-set though not very coarse; elytra one-half longer than wide, as wide as the prothorax and rather more than twice as long, the punctures quite coarse, impressed and somewhat close-set. Length 1.75–1.8 mm.; width 0.75 mm. Montana (Missoula).....**montana**, sp. nov.

Antennal funicle equal in length to the club. *Male*.—Dark rufo-piceous, the elytra black, the legs and antennae pale, shining, the bristles stiff, erect and pale but rather sparse throughout; head well developed, the minute tubercles of the clypeus separated by a little more than a fourth of the width; prothorax nearly as in *montana* but nearly a third wider than long, with the punctures much less close-set; elytra one-half longer than wide, as wide as the prothorax and rather more than twice as long, the punctures moderately coarse, deep and

not very close-set. Length 1.5-1.7 mm.; width 0.65-.75 mm. Vancouver Island, Washington State and Northern California., *soror*, sp. nov.

- 24—*Male*.—Black and shining, the anterior parts picescent; legs and antennæ pale; bristles rather sparse, short and somewhat inconspicuous anteriorly, longer on the elytra; head well developed, the minute clypeal tubercles separated by a fifth of the width; prothorax nearly as in *soror* but fully two-fifths wider than long, the punctures strong and well separated; elytra suboval, not more than two-fifths longer than wide, rather wider than the prothorax and distinctly more than twice as long; punctures only moderately coarse but deep and quite sparse. Length 1.6-1.75 mm.; width 0.75 mm. New York.

curtula, sp. nov.

- 25—Anterior tibiæ everted and acute externally at apex; hairs very long, a fifth or sixth as long as the entire width of the elytra. *Male*.—Body stout, cylindric, polished, piceous in color, the vestiture very long and bristling, abundant; head and eyes moderately developed; front feebly concave; clypeus with two long slender erect and widely separated processes; prothorax slightly wider than long, the sides just visibly convergent and nearly straight from base nearly to the apex, then rounding and strongly convergent to a trapezoidal and obliquely upturned lamina, which is subtriangularly emarginate at tip; surface with rather strong and close-set punctures, feebly impressed at apex behind the lamina; elytra short, cylindric, obtuse at apex, two-fifths longer than wide, as wide as the prothorax and three-fifths longer, the punctures rather coarse, even, moderately close-set, the surface not at all rugose. *Female*.—Smaller than the male, the clypeus feebly reflexed at each side; prothorax shorter and more transverse, simple. Length 1.75-2.1 mm.; width 0.75-0.9 mm. Florida (Lake Worth)., *hirsuta*, sp. nov.

- Anterior tibiæ simple at apex, not dilated or produced; hairs shorter, about an eighth as long as the entire width of the elytra. *Female*.—Oblong-oval, moderately convex, shining, pale rufo-testaceous, the vestiture only moderately abundant and not dense; head moderate, the eyes small; clypeal margin feebly reflexed at each side; prothorax nearly one-half wider than long, parabolically rounded at apex, the sides becoming parallel and nearly straight behind the middle; punctures fine and rather sparse, elytra suboval, rather ogival at tip, two-fifths longer than wide, rather wider than the prothorax and more than twice as long, the punctures somewhat coarse but feeble, well separated; humeral callus rather small and feeble. Length 1.4 mm.; width 0.65 mm. Alabama.

ursulina, sp. nov.

Fuscipes is our most abundant species, and the west coast *impressa* resembles it very much in external appearance. Mellié states that the anterior margin of the head in the male of *fuscipes* is surmounted by two very small tubercles; this is not the case in the representatives before me, but as Mellié included with his American specimens some from Madeira, it is probable that he had one of these under observation, and that it is a species different from *fuscipes*. *Vitula* of Mannenheim, is assigned to *Ennearthron* in the Henshaw list, but without

reason, as it is in no way related to that genus, and the *Cis dichrous*, of that list, is a manuscript name, appearing only in the LeConte list of Coleoptera. *Hirsuta* and *ursulina* are remarkable in having long fine and bristling pubescence. *Hystricula* seems to have the elytral bristles vaguely inclined to serial arrangement, and it is undoubtedly more closely allied to *mormonica* than to the three species immediately following it in the table. The Alaskan *Cis ephippiatus*, of Mannerheim, (Bull. Mosc., 1853, p. 234), is omitted from our lists. It is unknown to me, but seems to be peculiar in having the elytra profoundly and remotely, subseriatly punctate, red, with a large common transverse black spot at the middle, which attains the margin at each side.

Orthocis, gen. nov.

This genus is very closely allied to *Cis*, but differs in the more parallel form of the body, in its glabrous surface, margined elytral suture and absolutely simple apex of the anterior tibiæ. The maxillary palpi are rather stout, the ligula large and corneous, the antennæ long, with the two basal joints of the funicle elongate and the club rather small and loose. The head and clypeus are absolutely simple in the male, and the only visible male sexual character is a small oval opaque and densely pubescent area at the centre of the first ventral segment, at the point occupied by a deep circular fovea in some species of *Cis*. Our two species greatly resemble each other but may be distinguished as follows:—

Ligula broader and flat; third antennal joint nearly or quite as long as the next two combined; body rather less elongate, the sides of the prothorax somewhat less rectilinear, otherwise similar to the following. New York . . . **punctata** Mell.

Ligula narrow and convex; third antennal joint distinctly shorter than the next two combined. *Male*.—Oblong, parallel, moderately convex, polished, black, the legs and antennæ rufous, glabrous, each puncture of the elytra with a very minute simple silvery hair; head well developed, convex, the eyes small and prominent; clypeal margin perfectly simple, evenly arcuate from side to side; prothorax two-fifths wider than long, the sides parallel and straight, rather widely reflexed; apex broadly arcuate and slightly advanced; angles obtuse; base finely margined; punctures rather fine but deep, well separated; elytra two-thirds longer than wide, rather wider than the prothorax and nearly two and one-half times as long, obtusely ogival at apex, the sides very feebly arcuate; punctures confusedly arranged, rather small but deep and somewhat sparse, the surface smooth; elytral suture margined toward tip. Length 2.3–2.5 mm.; width 0.85 mm. California (Alameda Co.) **atterrima**, sp. nov.

Xestocis, gen. nov.

A few species of peculiar facies are separated under this name, because of the prosternal carination. The antennæ are of the normal structure, with the club well developed and the second funicular joint only slightly longer than wide. The anterior tibiæ are strongly oblique and acute externally at apex, except in *opalescens*, where the external angle is slightly thickened and rounded. The maxillary palpi are usually rather slender. The first ventral segment is subfoveate and densely pubescent at the centre of the disk in the males. Our five species are strongly differentiated among themselves, and may be described as follows:—

- Boby glabrous.....2
 Body clothed with short pubescence or bristles.....3
 2—Clypeus bidentate in the male, the prothorax simple and rounded at apex in both sexes. *Male*.—Suboval, very dark rufo-piceous, sometimes paler, polished; head and eyes moderately developed; prothorax two-fifths wider than long, the sides just visibly convergent from base to the obtuse apical angles, rather distinctly and evenly arcuate; lateral margin very fine, the base finely margined, more distinctly in the middle; punctures minute and rather sparse; elytra less than one-half longer than wide, twice as long as the prothorax and barely wider, rather narrowly rounded at apex, very feebly subrugulose, minutely, sparsely punctate. Length 1.5–1.9 mm.; width 0.7–0.85 mm. Canada (Toronto), New Jersey, Pennsylvania, Indiana and Iowa.....*levettei*, sp. nov.
 Clypeus monocrate in the male, the prothorax with two long slender porrect processes. *Male*.—Oblong-oval, convex, testaceous, polished, glabrous, each puncture with an excessively minute hair; head and eyes moderately developed, the front impunctate, broadly concave, the clypeus reflexed, with a long erect parallel process at the middle, feebly expanding toward apex, the latter very feebly emarginate; prothorax distinctly wider than long, the sides moderately convergent and evenly arcuate throughout, the apex prolonged over the head and with two long remote straight and porrect processes, the surface behind their separating sinus broadly impressed; punctures fine, not very sparse; elytra short, one third longer than wide, twice as long as the prothorax at the median line and somewhat wider, rather rapidly and narrowly rounded at apex, the sides arcuate; surface nearly smooth, minutely, rather sparsely punctate. *Female*.—Nearly similar to the male, the clypeus broadly sinuate at the middle, the prothorax broadly rounded at apex. Length 1.2–1.35 mm.; width 0.55–0.6 mm. Pennsylvania (Westmoreland Co.) and Rhode Island (Boston Neck).....*miles*, sp. nov.
 3—Upper surface normal; vestiture distinct, even but arranged without order; punctures of the elytra intermingled with larger sparse punctures, which are sometimes disposed in vague series; clypeus bidentate in the male.....4
 Upper surface covered with a waterproof crust, through which the extremely minute simple hairs protrude.....5
 4—Vestiture composed of small simple and subdecumbent hairs *Male*.—Oblong-oval, moderately convex, rufo testaceous, feebly shining; prothorax wider than

long, minutely but strongly, closely punctate; elytra two-fifths longer than wide, ogivally rounded at apex, finely, rather closely punctured and vaguely subrugose. Alaska (Sitka) and Queen Charlotte Islands (Massett).....**biarmata** Mann.

Vestiture composed of coarse stiff and suberect squamules. *Male*.—Slightly smaller than *biarmata* but similar, oblong-oval, moderately convex, testaceous, feebly shining, the bristles short and abundant; head rather small, feebly concave, the eyes moderate; clypeus triangularly reflexed at each side; prothorax nearly one-half wider than long, the sides just visibly convergent, feebly and evenly arcuate; angles obtuse; apex subangularly produced and rounded, with the tip very narrowly sinuato-truncate; punctures moderately fine, deep and quite dense; elytra not quite one-half longer than wide; less than twice as long as the prothorax and somewhat wider, feebly rugulose, minutely and rather closely punctate, the punctures smaller than those of the prothorax; apex ogivally rounded. Length 1.6 mm.; width 0.7 mm. Pennsylvania (locality not recorded).

insolens, sp. nov.

5—*Male*.—oblong oval, rather stout, only moderately convex, polished, dark piceo-testaceous; head moderate, the eyes small but prominent; front broadly concave, the clypeus acutely, bitriangularly reflexed; prothorax one-half wider than long, the sides very feebly convergent, rather strongly, evenly arcuate; apex subtriangularly prolonged, with the tip minutely emarginate and feebly reflexed; punctures rather fine but distinct, slightly separated; lateral margins narrowly reflexed; elytra short, scarcely a third longer than wide, as wide as the prothorax and four-fifths longer, the apex rather acutely ogival; surface not very finely, evenly and rather closely punctate. Length 1.4–1.6 mm.; width 0.6–0.75 mm. Pennsylvania (Westmoreland Co.).....**opalescens**, sp. nov.

Biarmata is misprinted "*bicarinatus*" in the Henshaw list.

Brachycis, gen. nov.

The chief peculiarities of the single type of this genus are the short and suboval form, very short, transversely excavated prosternum and obsolescent side margin of the prothorax at the rounded and obtuse apical angles. The antennal club is strongly developed, as long as the preceding six joints combined and has the sensitive apical pores small but deep and bristling with white setæ, thus leading up to the remarkable *Plesiocis* which follows. The maxillary palpi are rather slender and acutely pointed, and the anterior tibiæ are finely, acutely and almost perpendicularly produced externally in a well-marked process. Sexual characters are wanting in the single specimen before me, which is probably a female:—

Broad, moderately convex, oblong-oval, piceous, the elytra, legs and antennal shaft paler rufo-testaceous; body clothed above with stiff pale and erect setæ, moderate in length and density, uniformly distributed; head rather small, the eyes moderate; clypeus simple, subtruncate; prothorax two-thirds wider than long;

angles rounded, the sides strongly convergent and broadly arcuate from base to apex, the latter broadly subparabolic, not extending much over the head; punctures not very coarse but deep, rather close-set; elytra oblong, very broadly, obtusely rounded at apex, one-fourth longer than wide, two and one-half times as long as the prothorax, and, at apical third or fourth, visibly wider; sides nearly straight; punctures rather coarse, deep and somewhat close set, the surface nearly smooth. Length 1.4 mm.; width 0.75 mm. New York (Ithaca)

brevicollis, sp. nov.

Plesiocis, gen. nov.

This genus, which is also represented at present by a single species, is remarkably distinct in the structure of the antennæ, which are 9-jointed, with the club large and well developed, more corneous than usual, dark in color and with the two sensitive subapical pores on each side large, rounded and filled with white spongy pubescence; the club is nearly as long as the entire basal portion, with its first two joints transverse and obtriangular. The maxillary palpi are well developed, but rather slender, the prosternum normal, the process however rather thin and sublamellar. The anterior tibiæ are strongly, obliquely produced and acute externally at apex. The male has very simple characters, the clypeus having two minute and rather approximate tubercles, but the first ventral segment has, as in so many other cases, a small pubescent fovea at the centre of the disk. The type resembles a large sub-cylindrical *Cis*:—

Body cylindric-oval, strongly convex, piceous-brown, shining, the legs and antennal shaft rufous; vestiture rather sparse, the hairs coarse, pale, stiff and erect, moderate in length; head rather small, the eyes moderate, convex; front flat, finely punctate; prothorax two-fifths wider than long, the sides feebly convergent and slightly arcuate, the basal angles rather broadly rounded, the apical obtusely subprominent; lateral margin narrowly reflexed; base finely margined; apex broadly rounded, slightly produced over the head; punctures coarse, perforate and close-set; elytra one-third longer than wide, twice as long as the prothorax and scarcely at all wider, the sides nearly straight, the apex very broadly and obtusely rounded; punctures coarse, perforate, close-set and arranged evenly but without order, the interspaces smooth. Length 2.1–2.3 mm.; width 1.0–1.1 mm. California (Mokelumne Hill, Calaveras Co.) *cribrum*, sp. nov.

Ennearthron Mellié.

The small cylindrical species which compose this genus may be readily identified by the characters given in the table. The antennæ are slender, with the club rather feeble, the first joint of the funicle generally equal to the next two, which, with the last are equal and moniliform. Prosternum moderately developed before the coxæ, with

the process very narrow and sublamellar. The male characters are always pronounced and generally affect both the clypeus and thoracic apex, but these characters greatly diminish in degree in the smaller and less developed males, these depauperate individuals not differing much from the females in either the present genus or *Ceracis*. In both of these genera the male also has a small deep pubescent fovea, not at the centre, but near the posterior margin, of the first ventral segment. The characters of the following table are taken throughout from what appear to be fully developed males only:—

Male with the clypeal margin broadly and strongly reflexed in a trapezoidal process, the thoracic process bidentate. 2

Male with a long slender erect clypeal process, the thoracic apex simple and rounded; species very small. 11

2—Elytra without trace of impressed lines. 3

Elytra with very feebly and unevenly impressed lines, the punctures feebly subserial in arrangement. 10

3—Male with the thoracic processes longer, narrower and more approximate; punctuation feeble, the elytral punctures always confused in arrangement. Atlantic and Gulf regions. 4

Male with the thoracic processes shorter, more widely separated and more lamellarly triangular; punctuation stronger, the elytral punctures generally confused but occasionally very feebly subserial. Pacific Coast regions. 6

4—Apex of the pronotum rather feebly impressed behind the processes. 5

Apex of the pronotum strongly, transversely impressed behind the processes. Moderately slender, polished, piceo-rufous in color; head well developed, concave, the clypeal process large and well developed, with the apex feebly sinuate at the middle; prothorax slightly wider than long, the sides parallel and nearly straight, the angles all rounded; processes long, slender and distinctly diverging as usual; base and sides finely margined; punctures fine and sparse; elytra less than one-half longer than wide, as wide as the prothorax and two-thirds longer, the surface very feebly subrugulose, sparsely and very minutely punctate, the punctures much more minute than those of the pronotum; apex evenly rounded. Length 1.2–1.5 mm.; width 0.45–0.6 mm. Texas (Columbus) and Louisiana.

piceum, sp. nov.

5—Elytra fully one-half longer than the prothorax, slender, cylindric oval, black, rather strongly shining; legs, mouth parts and antennæ pale; punctures fine and rather sparse; thoracic processes rather short. Canada to Pennsylvania (*mell*, i Mell., *unicolor* Csy.) **thoracicornes** Zieg.

Elytra very short and quite strongly cuneiform, very much less than one-half longer than the prothorax. Rather stout, the head polished and concave, the eyes small; clypeal process well developed but with the sinuate sides rather rapidly converging, the apex a little less than half as wide as the head, feebly sinuato-truncate; prothorax large, not quite as long as wide, the sides parallel and broadly arcuate, the corneous processes moderately long and rather stout; punctures fine but distinct, only moderately sparse; elytra at base as wide as the

prothorax, the sides nearly straight and distinctly convergent, the apex narrowly rounded; punctures rather sparse and very minute, the surface feebly rugulose. Length 1.3 mm.; width 0.53 mm. Louisiana (Morgan City).

laminifrons, sp. nov.

6—Thoracic process of the male abruptly formed. 7
Thoracic process gradually formed, its sides merging gradually and obliquely into the sides of the prothorax; thoracic punctures quite dense. 9

7—Elytral punctures rather coarse and closer; thoracic process one-half as wide as the elytra. Body rather stout, blackish, the elytra piceous; legs and oral organs pale; lustre moderately shining; head and eyes moderately developed; clypeal process very broad, only moderate in length, almost transversely truncate; prothorax only slightly wider than long, the sides parallel and broadly arcuate; apical process very broad, deeply sinuate; punctures strong and close-set; elytra quite distinctly narrower than the prothorax and scarcely more than one-half longer; one-half longer than wide, the sides parallel; apex broadly rounded; surface feebly rugulose, strongly punctured, less closely than the prothorax. Length 1.4–1.7 mm; width 0.55–0.7 mm. California (southern). **grossulum**, sp. nov.

Elytral punctures fine but distinct, rather sparse, the thoracic process much less than one-half as wide as the elytra. 8

Thoracic punctures close-set; angles of the clypeal process scarcely at all rounded. Blackish, the elytral punctures generally very feebly subserial in arrangement. California (especially northern coast regions) **californicum** *Csy.*

Thoracic punctures sparse; angles of the clypeal process rounded. Body evenly cylindric, moderately shining, more or less rufo-testaceous in color, the elytra sometimes blackish toward base; head and eyes moderate, the clypeal process moderately strong, with the sides rather strongly convergent and the apex broadly sinuate; prothorax slightly transverse, the sides parallel and almost straight, rounding anteriorly, the process rather feebly developed, sinuate at apex; elytra scarcely one-half longer than wide, as wide as the prothorax and three-fifths longer, the sides parallel and straight, the apex broadly rounded; punctures fine and sparse, the surface almost smooth. Length 1.2 mm.; width 0.5 mm. California (Sonoma Co.). **discolor**, sp. nov.

9—Narrowly cylindric, blackish, the elytra rufescent at tip; legs, trophi and antennæ pale; surface moderately shining; head well developed, the clypeus moderate in length, with the sides strongly convergent, the apex broadly sinuato-truncate and the angles blunt; prothorax but little wider than long, the sides subparallel and very slightly arcuate; process rather short, sinuate at tip; elytra fully one-half longer than wide, as wide as the prothorax and fully three-fourths longer, somewhat parabolically rounded at tip, the punctures fine but strong, but little smaller than those of the prothorax and much less close-set. Length 1.1–1.3 mm.; width 0.4–0.5 mm. California (Los Angeles). **convergens**, sp. nov.

10—Moderately stout, piceous to blackish in color, with the elytra paler; legs, trophi and antennæ pale, the club dusky; surface polished; head well developed, broadly concave, the clypeus only moderately reflexed, the apex broadly truncate; prothorax but little wider than long, the sides subparallel and broadly, distinctly arcuate; process rather short, lamelliform, with a triangular incisure at the middle, the process abruptly formed; punctures very fine and sparse; elytra short,

less than one half longer than wide, scarcely as wide as the prothorax and one-half longer, evenly rounded at apex, the punctures minute and sparse, those of the series larger and closer. Length 1.0-1.2 mm; width 0.4-0.5 mm. Florida.

pullulum, sp. nov.

- 11—Narrowly cylindric-oval, moderately shining, pale flavo-testaceous throughout; head and eyes well developed, the front concave; clypeal process narrow, long, the apex strongly rounded; prothorax distinctly wider than long, the apex evenly and circularly rounded, the sides becoming parallel toward base; punctures very minute, sparse and feeble; base distinctly margined as usual; elytra fully as wide as the prothorax and two-thirds longer, not quite one-half longer than wide, parabolically rounded at tip, margined at base, the punctures sparse, very feeble and extremely minute, even smaller than those of the prothorax; surface smooth. Length 1.0-1.1 mm.; width 0.4-0.45 mm. Florida. **unicorn**e, sp. nov.

Unicorne is evidently closely related to the Brazilian *corniferum* of Mellié, but in that species the cephalic process is said to be broad, recurved and narrowed to the acute apex.

Ceracis Mellié.

This genus is scarcely distinct from *Ennearthron*, agreeing in facies and in every structural feature except the antennæ, which are 8-jointed; one of the small joints of the funicle being eliminated. The two species before me are as follows:—

Rufo-testaceous, the elytra blackish toward base; punctures very minute and sparse, the remaining characters nearly as in *punctulata*. Louisiana [Mellié], North Carolina and Pennsylvania (Westmoreland Co.) **sallei** Mell.

Black throughout, the head and prothorax sometimes picescent; legs, trophi and antennæ pale; surface polished, the elytra nearly smooth; head and eyes well developed; clypeal process rather well developed, with its sides but slightly converging, the apex broadly sinuato-truncate; prothorax slightly shorter than wide, the sides feebly convergent and broadly arcuate from the base to the rather pronounced but obtuse apical angles; process very abruptly formed, moderate in length, the exterior angles somewhat everted and the apex deeply sinuate; punctuation quite deep and close-set but rather fine; base finely margined; elytra at base as wide as the prothorax, less than one-half longer than wide; the sides nearly straight and feebly convergent; apex broadly rounded, base not in the least margined; punctures finer and sparser than those of the prothorax, confusedly arranged. Length 1.25-1.3 mm.; width 0.55-0.6 mm. Florida.

punctulata, sp. nov.

The species recently described from Lower California by Dr. Horn, under the name *similis*, appears to resemble *sallei*, but differs from both the above in having the elytral punctures coarser than those of the prothorax, a very exceptional character in *Ennearthron* and *Ceracis*.

Octotemnus Mellié.

This is a very pronounced and distinct genus, differing from *Ennearthron* in the oval outline of the body, absence of male sexual characters of the head and prothorax, and in tibial structure. The maxillary palpi are slender and pointed, the antennal club well developed and very loose, the joints being attached by very slender pedicels and with the sensitive pores approximate at each side of the apex. The prosternum is short and somewhat concave before the coxæ, with the process thin and laminate. There is no fovea on the first ventral segment of the male, but the surface is feebly and approximately bi-impressed near the base, the intervening area elevated and prolonged backward in an isolated triangular point, a structure not suggested elsewhere in the family. The surface is glabrous, but the elytra have a few widely dispersed erect setæ. Our two species are very closely allied; they may be described as follows from the male:—

Form more narrowly oval; size larger, the basal abdominal process of the male very acute at apex, pale testaceous, polished throughout; head and eyes well developed, the latter convex; front broadly, evenly convex, very minutely, sparsely punctate; clypeal margin slightly thickened for a short distance from the eyes; prothorax but little wider than long, circularly rounded at apex, the sides diverging slightly to the base; angles all very broadly rounded; base very minutely margined; punctures very minute, feeble and sparse; elytra fully one-half longer than wide, a little wider than the prothorax and nearly twice as long; sides feebly arcuate, the apex rather narrowly parabolic; base not margined; humeral callus very small, feeble; surface feebly rugulose, the punctures extremely minute and sparse. Length 1.4–1.75 mm.; width 0.55–0.75 mm. Pacific coast (from Vancouver to San Francisco) **denudatus**, sp. nov.

Form rather shorter and more broadly oval, polished, the pronotum more or less alutaceous, blackish to pale flavo-testaceous throughout; head and prothorax nearly as in *denudatus*, the elytra barely one-half longer than wide, distinctly wider than the prothorax and barely twice as long, the surface nearly smooth, very minutely, sparsely punctate. Length 1.35–1.6 mm.; width 0.6–0.65 mm. Rhode Island, New York and Pennsylvania **lævis**, sp. nov.

Both of these species are very common, and it is remarkable that they have not been heretofore described. Perhaps the *Cis punicatus* of Mellié may be the same as *lævis*, but that species, taken apparently near New Orleans, is said to have the prothorax longer than wide and the elytra only one-half longer than the prothorax, which language agrees rigorously also with the figure and in no way suits either of the above species.

SPHINDIDÆ.

This family forms a very good transition to the Cryptophagidæ. The antennæ are of a more perfectly clavicorn type than in Cioidæ, and have a large compact club, with the ninth joint variable in size. The mentum is very large, in striking contrast to the Cioidæ, where it is unusually minute. The maxillary palpi are small, slender and pointed and the anterior coxæ rather widely separated. The clypeus is convex, continuous with the front, narrowed and continued over the larger part of the mandibles, the labrum being small, almost atrophied in *Odontosphindus*, the epistomal suture fine and posteriorly arcuate. The eyes are large, convex and coarsely faceted. The two genera before me may be distinguished as follows:—

Tarsi heteromerous; antennæ 11-jointed, the ninth joint wider than the eighth, but very short, the club virtually 2 jointed, large and nearly cylindrical; prothorax denticulate at the sides, the elytra with impressed series of coarse punctures; body glabrous **Odontosphindus**

Tarsi pentamerous; antennæ 10-jointed, the club variable, 2 or 3-jointed; prothorax not denticulate, the elytra with unimpressed series of fine punctures; body sparsely pubescent. **Sphindus**

Another genus, *Eurysphindus*, has been described by LeConte, but I have seen no example; the inferior flanks of the prothorax are said to be deeply concave and the body clothed with erect hair.

Odontosphindus Lec.

These species are much larger than those of *Sphindus* and are distinguishable at once by the characters of the table; the two species are as follows:—

Sides of the prothorax scarcely at all reflexed, finely margined. Atlantic regions.

denticollis Lec.

Sides of the prothorax distinctly though not very broadly explanato-reflexed, more strongly and quite irregularly denticulate. Body subparallel, moderately convex, pale rufo-testaceous in color, shining though somewhat alutaceous in lustre; head moderate in size, the epistoma polished and impunctate; eyes moderately large, convex; antennæ as long as the width of the head, the first joint large, the second more slender, contorted at base as usual; prothorax quite transverse, parallel, the sides feebly arcuate; punctures rather coarse and close set; elytra only just visibly wider than the prothorax, three-fourths longer than wide, the serial punctures obsolete toward tip. Length 3.0–3.5 mm.; width 1.25 mm. California (Sonoma Co.) **clavicornis**, sp. nov.

Clavicornis is materially larger than *denticollis*, and has a larger, more transverse and more coarsely punctured prothorax.

Sphindus Chev.

The species of this genus are small and oblong, with duller surface lustre and moderately long, rather sparse pubescence, serial in arrangement on the elytra. The three species before me may be thus separated :—

Antennal club 2 jointed. 2

Antennal club purely 3-jointed. 3

2—Pronotum minutely and rather closely punctured, more or less rufo-piceous in color. Atlantic regions to Iowa **americanus** Lec.

Pronotum more coarsely and quite sparsely punctured. Body black, stouter, dull in lustre ; head and eyes moderate in size, the epistoma polished ; antennæ a little longer than the width of the head, the club only moderately stout, the tenth joint twice as long as the ninth ; prothorax nearly twice as wide as long, the sides just visibly convergent from base to apex, feebly arcuate ; apex broadly arcuate ; elytra scarcely a fourth longer than wide, barely wider than the prothorax and two and one-half times as long ; serial punctures rather fine, the intervals dull and minutely shagreened. Length 1.9 mm. ; width 0.9 mm. Colorado (Buena Vista—8000 feet). **crassulus**, sp. nov.

3—Narrowly oblong, more shining, piceous black, the elytra, legs and antennæ pale testaceous ; head moderate, the eyes large and convex, separated by about three times their own width ; antennæ moderate in length, the last three joints forming a compact subcylindric club ; prothorax much smaller than in the two preceding species, transverse, the sides subparallel ; surface evenly convex, very minutely and not very closely punctulate ; elytra two-fifths longer than wide, about a fifth wider than the prothorax and three times as long ; serial punctures feeble but distinct, the intervals smooth and alutaceous ; apex obtusely rounded as usual. Length 1.7 mm. ; width 0.7 mm. Canada (Toronto).

trinifer, sp. nov.

Americanus varies greatly in size as usual in this and neighboring families ; it is quite abundant and occurs in fungi of various species.

THE LIFE-HISTORIES OF THE NEW YORK SLUG CATERpillARS.—XV.

PLATE VI, FIGS. I—II.

BY HARRISON G. DYAR, A.M., PH.D.

Heterogenea flexuosa Grote.*

- 1880—*Limacodes flexuosa* GROTE, North Am. Ent. I, 60.
 1880—*Limacodes cæsonia* GROTE, North Am. Ent. I, 60.
 1894—*Heterogenea cæsonia* and *flexuosa* NEUMOEGER & DYAR, Journ. N. Y. Ent. Soc. III, 74.

LARVA.

- 1878—GLOVER, Ill. North Am. Ent. pl. 95, fig. 19.
 1893—PACKARD, Proc. Am. Phil. Soc. XXXI, 105 (as "full grown larva of *Heterogenea* sp.").
 1895—DYAR & MORTON, Journ. N. Y. Ent. Soc. III, 146 (in synopsis).
 1896—DYAR, Journ. N. Y. Ent. Soc. IV, pl. VI, figs. 3 and 4 (as *Tortricidia pallida*).

SPECIAL STRUCTURAL CHARACTERS.

Dorsal space narrow, of even width, scarcely narrowing at the ends, gently arched; joint 13 rounded prominent. Lateral space broad, oblique, narrowing to the extremities; subventral space small, retracted. Subdorsal ridge slight; indicating the change in direction between back and sides; lateral ridge rather prominent, overhanging the subventral space. Outline elliptical, joint 13 only slightly notched on the sides, not forming a quadrate tail. Depressed spaces (1)–(8) present, the subventral ones (7) and (8) only indicated, the others sharp edged and deep, large, dividing the surface into latticed ridges as in *Tortricidia pallida*, (4) the largest, transversely elongated, the lower segmental (5) moderate, the intersegmental (6) very small, alternating exactly in line with the lower edge of (5). Skin surface covered with coarse clear granules, the depressed spaces finely granular in the base. In the first stage the setæ are arranged as in *T. pallida*, but disappear at the first molt when all the structural characters are assumed nearly in their mature form. Coloration of the pattern and colors of *T. pallida*, modified in detail.

* This is not a *Heterogenea*; but I reserve generic corrections till the end of these articles.

AFFINITIES, HABITS, ETC.

This larva is very closely allied to *T. pallida*, but differs in several characters, nearly all of which are a higher specialization. In stage I the setæ are smaller, not so distinctly alternating and the anterior limb of the Y-shaped spines is slightly shortened. After the first molt the setæ are nearly obliterated, being much more reduced than in *T. pallida*. The granules are smoother, more appressed, not subpapillose on the lateral ridge as in the younger stages of *T. pallida* and the depressed spaces are, if anything, larger. The red mark appears at the same time or sooner than in its ally, but is never so large. It does not exceed the lateral extension of *T. pallida* of stage V even in the last stage, VII, though the longitudinal extension is the same in both in the case of the most heavily marked *H. flexuosa*. The amount of variation is perhaps not greater in *flexuosa* than in its ally, though the breaking up of the red band gives the appearance of greater diversity.

The moths emerge during the last week in June and lay the eggs singly on the backs of the leaves. The favorite food plant is the chestnut and the larvæ occur on the lower of the main branches of this tree, not on the low shoots nor on any but the old matured leaves. The oak is also a food plant; I have found the larvæ abundantly on *Q. coccinea*, very rarely on *Q. alba*. The larvæ mature early in September. This species occurs scattered all over New York State, usually rare, but occasionally locally common. I have taken it in most of the wooded parks around New York City and at various places in Long Island. The present life-history was completed from a newly hatched larva which I found in Bronx Park after a two days' search, in which I was kindly assisted by Mrs. P. N. Knopf and Miss L. I. Hoff.

CRITICISM OF PREVIOUS DESCRIPTIONS.

Dr. Packard has described this larva without knowing what it was. I have made an unfortunate error in the description of *Tortricidia pallida* (Journ. N. Y. Ent. Soc., IV, 170-1), and included characters of *H. flexuosa* in stages II, III and VI. The figures on the plate of the young larva (figs. 3 and 4) represent stages IV and VI of *H. flexuosa*. The text of *T. pallida* will be specifically corrected in the "additions and corrections" to follow at the end of these articles.

DESCRIPTION OF THE SEVERAL STAGES IN DETAIL.

Egg.—Elliptical, flat as usual; $1.1 \times .7$ mm., the shell colorless, white.

Stage I.—Rounded elliptical, tail round; skin smooth, depressed a

little dorsally above the bases of the tubercles in paired hollows. All colorless. Setæ Y-shaped in the subdorsal row on joints 4-11, the front limb a little shorter than the back one (Plate VI, fig. 1); two setæ on joints 3 and 13; a middle row of two on each of joints 3 and 4; a single lateral row on joints 3-12. Tips of setæ a little enlarged, not distinctly swollen. Subventral setæ very fine, obscure, all pale. Head colorless, eye black; body whitish, food greenish. Length, .9-1.4 mm.

Stage II.—Narrowly elliptical, tail rounded quadrate; dorsum broad and flat, the subdorsal ridge forming its sharply angled edge. Smooth, regular, all the depressed spaces (1) to (6) large and very distinct. Sides concave, lateral ridge smooth; subventral area retracted. Latticed ridges covered with smooth, dense, frosted, appressed granules, one row wide, uniform, not papillose anywhere. Setæ absent. Color opaque whitish; later distinctly pale green. Length, 1.3-1.8 mm.

Stage III.—Rounded, rather broadly elliptical, sides concave at first so that the dorsum stands up as a broad ridge gently arching from head to tail. Tail slightly notched at the sides, rounded. Depressed spaces very distinct, (4) narrowly elongate. Latticed ridges beaded with clear appressed granules, not generally over one granule wide in the narrower parts. Bottoms of the spaces finely granular, dotted, the larger ones with shallow, saucer-like centers. Color green; a yellow line appears along the subdorsal ridge on joints 5-9, widened a little on each segment. Usually no other marking, but there may be a small, faint, or even distinct dark red dot between the lines on joint 8, or surrounding the depressed space (1) of joints 7-8. Length, 1.8-2.4 mm.

Stage IV.—Rather narrowly elliptical; tail rounded quadrate. Dorsum rather narrow, a little grooved at first. Lateral ridge extending beyond the subventral one. Depressed spaces large and sharp, the latticed ridges scarcely more than one granule wide, but the granules becoming wedge-shaped. All smooth, no setæ. Color light green, the yellow subdorsal lines reaching joints 5-10. The dorsal yellow mark varies from a narrow yellow bridge on joint 8 to a red bar on joints 7-8 (see the plate of *T. pallida*, pl. IV, fig. 3) or even a rather large round red patch, which does not encroach on the subdorsal lines. Length, 2.4-3.2 mm.

Stage V.—Shape as in the mature larva; tail rounded, scarcely notched at the sides. Dorsum not broad, sides oblique, concave. Latticed ridges several granules wide, smoothly evenly granular, a little frosted. Spaces finely shagreened with a circular shallow saucer-like centre. Color green, spaces not discoloured except a little yellow in

(4); a yellow subdorsal line on joints 3-12, not quite reaching either extremity, the pair unconnected at the ends, but centrally on joints 6-9, broadened to the top of the depressed spaces (4) and enclosing in the dorsal space a reddish patch on joints 7-8 with salmon-colored margin and dark brown latticed ridges. In some examples a reddish mark appears on joint 3 between the subdorsal lines. Length, 3.2-4.3 mm.

Stage VI.—Structures as before, tail rounded quadrate. Depressed spaces large, the latticed ridges closely clear granular. Green, the large lateral depressed spaces (4) shaded with yellow. The yellow subdorsal lines reach joints 3 and 13, entirely free * or joined by a yellow bridge on joints 7 to 9 containing a red spot of varying form, corresponding to the variety of the larva. In an example from Bellport, Long Island, the spot was cordate, the depression in front, pink and edged with a crimson line. In another it was in the form of a cross, darker, shaded with brown on the latticed ridges and encroaching on the subdorsal line. (See *T. pallida*, pl. VI, fig. 4.) In others the shape was circular, or of the form of the "club" or "spade" as usually depicted on playing cards. There is also another spot at the anterior end. In the Bellport larva it was elliptical, covering joint 3 dorsally, bright red and edged with yellow. In another from Fort Lee, N. J., it was shaded with dark brown like the central spot. It was present in a larva which lacked the central spot entirely. Length, 4.2-6.3 mm.

Stage VII.—(Plate VI, figs. 5 to 9.) Shape as described. Dorsal space of uniform width, scarcely narrowing anteriorly. Skin rather regularly coarsely watery granular on the latticed ridges, the depressed spaces narrow, finely granular. Color pale yellowish green, pigmented in the dorsal and upper half of lateral space, clearer green below. All the depressed spaces yellow in the bottom, the largest with glandular green centers. Subdorsal line yellow, straight from joint 3 to the tail, rather broad. On the anterior edge of joint 3 a red mark, widened along the edge, produced backward in the dorsal space more or less. The central dorsal red mark is very variable. It may be absent (Plate VI, fig. 8) or represented only by a narrow yellow bridge on joint 8 slightly red tinted (Plate VI, fig. 9). The usual form is a rounded cross, reaching on the sides nearly or quite to the lateral depressed spaces (4) and in the dorsal space on joints 7 to 9; it may be enlarged to a hexagon (Plate VI, fig. 6) or extend in a dorsal band the whole

* Out of 263 larvæ which were found in an oak woods at Yaphank, L. I., only three were entirely without the yellow bridge (Plate VI, fig. 8).

length (Plate VI, fig. 5). The color is crimson, marked with purplish brown or blackish on the latticed ridges in the place of the usual spots, a more or less distinct square pale spot covering the depressed space (1) of joints 7-8. Length, 6.3-10 mm.

Cocoon as usual.

Food-plants.—Chestnut, oak, hickory, wild cherry.

EXPLANATION OF PLATE VI.

- Fig. 1. Stage I, side view enlarged, diagrammatic.
 “ 2. One of the single setæ more enlarged.
 “ 3. Larva in stage III enlarged.
 “ 4. Granules from young larva.
 “ 5. Mature larva, enlarged, full pattern.
 “ 6. The same, widest spot.
 “ 7. Front and side views.
 “ 8. Mature larva, most reduced pattern.
 “ 9. The same, a small red spot.
 “ 10. Moth of *Heterogenea flexuosa*.
 “ 11. The same, variety *cæsonia*.

NOTES ON SPECIES OF NOCTUA WITH DESCRIPTIONS OF NEW FORMS.

PLATE VII.

BY JOHN. B. SMITH, Sc.D.

In 1890 I published a revision of the species theretofore lumped under the generic term *Agrotis*, as Bulletin No. 44 of the U. S. National Museum, and divided up the species among fifteen genera, new and old. The general conclusions reached in that paper have approved themselves to me since that period; but the increased material has necessitated some changes in the standing of certain species.

The genus *Noctua* as restricted by me contained species with all the tibiæ spinose, the anterior not heavily armed; front smooth and feebly convex; antennæ in the male ciliate only; vestiture hairy, scaly or mixed; primaries with apices rectangular or rounded, and as a whole rather subparallel, if varying in width.

Nothing essential need be added to this description, and all the new forms since seen fit very nicely into the definition. Most of the addi-

tions have come from the northern portion of our country and emphasize the character of the genus as one of either high altitude or high latitude. It is quite probable that a few species yet remain to be discovered and these will in all likelihood be rather close allies to something already described.

The receipt of material from Manitoba and Calgary has, within the past few years, added considerable to our knowledge of the species of this genus and a very interesting example of close relationship is recorded here.

The additions above referred to have also enabled us to gain a better idea of the specific standing of some of our species and some of these facts are here recorded.

Noctua smithii Snellen.

Tijdschr. voor Entomologie, XXXIX, 157.

baja ‡Smith.

Bulletin 44, U. S. Nat. Mus. 78.

All authors who had written on the subject up to the date of Snellen's paper have assumed the identity of the European and North American examples labelled *baja*. Speyer, Zeller, Moeschler and Grote have all examined specimens from both countries and considered them as representatives of one species only. In the Revision above cited I pointed out that both Lederer and Speyer refer to the anterior tibiæ as unarmed, while in all the specimens seen by me they were spinose. Unfortunately I had no European examples for comparison, hence could only suggest the question: "whether we have not here as in the case of *triangulum* and *normaniana*, distinct species." Snellen has carefully compared specimens from both countries and finds the European form with constantly unarmed fore tibiæ. He therefore names the American form as above, while the structural difference thus brought out, assigns *baja* to my genus *Rhynchagrotis*. It is certainly remarkable that so well marked a structural difference should separate species superficially so much alike.

Snellen prefers to separate the European species on a somewhat different basis from that proposed by me, and does not accept my genera for their comparatively small number of forms. It must remain for the student with collections from all countries for comparison, to decide as to the advisability of subdivision and to select the basis for it.

It is also pointed out that *Carneades* Grt., is long since preoccupied by Bates, in Coleoptera. If the rule is to be strictly enforced, Mr. Grote's term must give way, probably to *Chera* Hubner.

Noctua hospitalis Grote.

Of this species I knew only the female type from the Hill collection in 1890. Mr. Grote was inclined in 1886 to consider this a form of *perconflua*, but as I pointed out, it is much nearer to the European *brunnea*. Two years ago Dr. Ottolengui took a perfect male at Manchester, N. H., which he kindly gave me, and recently I saw a specimen in the Strecker collection, labelled simply "N. Y."

The latter specimen was named *brunnea* and, compared with European examples in the same collection, no superficial differences were apparent. In view of what has appeared in other instances—notably that of *baja*—it would be unsafe to cite the two as identical; hence I present a picture of the male genitalia (Plate VII, fig. 9) for comparison with those of the European *brunnea* by any one with specimens of the latter at hand.

Noctua rubifera Grt.

There has been much confusion in collections between *rubifera* and *perconflua*, and even labels in Mr. Grote's handwriting are not always correctly applied. When the western forms were added, leading to *rosaria*, the confusion became yet greater and there seemed to be almost no line of division. *Esurialis* Grote, described from Washington I referred from a comparison of types in 1891 as a probable geographical race of *perconflua*.

Within the last five years I have received material in this group from all the Pacific Coast States, from Vancouver, from British Columbia, from Manitoba and from Calgary, and the result of a renewed study has been the conclusion that there are more species than has been realized, and that even in the East two species have been confused under the name *rubifera*. Fortunately Mr. Grote gives us a figure of his species (Can. Ent., VII, pl. I, f. 14), and of this type I have four examples from Orono, Me., Sharon Springs and the Adirondack Mountains, New York.

The sexual characters of the two males agree, and are not those figured by me on pl. IV, f. 37, Bull. 44 U. S. Nat. Museum. They are represented on the accompanying Plate VII, fig. 2. This species has the primaries rather narrow, especially in the male, the apex almost rectangular, outer margin evenly curved and the inner margin nearly straight. None of the ornamentation is at all contrasting, yet in most specimens a diffuse darker median shade is traceable.

Noctua cynica, sp. nov.

This species reminds one of *Orthodes cynica* in wing form and general appearance, hence I give it the same name. As compared with *rubifera*, with which it has been confused, it is much broader winged, with both costal and inner margins curved at least as decidedly as in *perconflua*. In maculation it does not differ from *rubifera*, except in the lack of a median shade in the specimens before me. But this may not be permanent, and I attribute most value to the wing form and the totally different genitalia of the male. It was this form that I dissected to illustrate *rubifera* in pl. IV, f. 37 of Bulletin 44, already cited, and a new figure is given on pl. VII, fig. 3, herewith. The differences between the two are simply in details and partly due to a difference in mounts. My examples are from the vicinity of Albany, N. Y.

It is not impossible that one or the other of these forms may really be the same as the European *rubi*, or the latter may even agree with one of the western forms. Unfortunately I have none for comparison.

Noctua jucunda Wik. = *perconflua* GRT.

This species has approximately the wing-form described for *cynica*, but is more brightly marked. All the specimens I have seen are distinctly mottled or shaded with yellow and the transverse lines are more irregular. The reniform is more regularly kidney-shaped and both spots are mottled, the orbicular quite usually open above.

The male was not before me in 1890, and a figure of the genitalia is presented herewith on pl. VII, fig. 4. It will be seen at once that it is of the same type as in *cynica* while yet very different in detail, and it shows that the new species follows its ally in wing form rather than that most like it in ornamentation.

Noctua calgary, sp. nov.

At various times Mr. F. H. Wolley Dod has been sending me examples which I have not been satisfied to place with either *rubifera* or *rosaria*, but named *rosaria*, I think. The recent receipt of specimens bringing the number up to three males and one female—a much better series was unfortunately ruined in sending—makes it possible for me to decide that we have a new species to deal with. Superficially it is distinct by the more trigonate primaries, which have rectangular apices, the outer margin straight to vein 3, then forming an obvious though obtuse angle inwardly. In all the specimens the ordinary spots are gray powdered and the median shade is obvious. The s. t. space is the darkest part of the wing in all examples and contrasts with the pale ter-

minal space. This is exactly opposite to what is usually found in *rubifera* and *rosaria*, and by this and the wing form the species may be recognized, I think.

The sexual characters of the male are quite different from those of the other allied species and are figured on plate VII, fig. 5. The derivation is evidently from the *rubifera* type, but is modified in both harpe and clasper at least as much as is indicated by the difference in wing form.

The examples before me vary in the amount of contrast in the ornamentation. In one specimen the space between the ordinary spots is black filled; in another it is still a little darker than the ground color; the others are intermediate. The female has the outer half of the median space darker than the basal portion of the wing; but this is probably not a sexual characteristic.

The dates given are in June and July and one specimen is marked bred from larva beaten from willows at night. Mr. Dod writes that he bred two examples and that the species is not uncommon.

Noctua rosaria Grt.

This species I have from British Columbia, Washington and the Sierra Nevada, California. It is like *rubifera* in size and wing form but the ground appears more even, while yet the ordinary spots seem more mottled. The specimens have a somewhat more rusty shading, which yet gives the impression of a velvety surface. It is almost impossible to put the difference into words; yet it exists and is visible on comparison, while its importance is demonstrated by the genital characters which are shown at plate VII, figs. 6 and 7. The differences between the two figures is that between a flat mount (fig. 6) and one in a cell (fig. 7); the latter showing the natural curves and position of parts.

Noctua esurialis Grt.

I have specimens from Corfield, Vancouver and from Portland, Oregon, which I take to be this species. The specimens from Vancouver agree perfectly with Mr. Grote's description and with my notes on the type when I referred it as a probable geographic race of *jucunda*. The latter it is decidedly not, but I am not certain that it is not a form of *rosaria*. Compared with the latter it seems somewhat broader winged and dirtier; darker and more sordid in color. Yet the differences are scarcely tangible and as my material is almost all from electric light globes it leaves something to be desired.

The genital structure of the male indicates a good species, but leaves

some doubt. The differences will be found in comparing fig. 8, in plate VII, with those cited for *rosaria*. The chief point is in the much narrower harpes and this amount of variation I have not seen equalled elsewhere in the same species. Three males, one from Corfield and two from Oregon are practically identical, while three specimens of *rosaria* from the three localities represented are also practically the same.

This study of the forms allied to *rubifera* will serve to indicate that our knowledge of the species is by no means even yet complete and that much remains to be done. The material in collections even of the Eastern forms is altogether insufficient in amount and character to fairly illustrate the species. All the examples of the forms referred to here should be preserved for careful study.

Noctua inopinatus, sp. nov.

Among the material received from Mr. A. W. Hanham, Winnipeg, Manitoba, are specimens that I have named *haruspica* with some doubt. Other examples from Corfield, Vancouver and 264 (Gillette) Colorado, have increased that doubt and I venture the above name to indicate a form intermediate between the eastern *haruspica* and the western *sierræ*. In size the new species averages less than *haruspica* and the color is as a whole more evenly smoky and with less red. The ordinary spots are somewhat better relieved, while the median lines tend to become broken and incomplete, while yet the detached parts may be well marked.

In all other respects, including sexual structure of the male, the agreement is with *haruspica* and the species may be deemed an impressionist one, rather than one based on sharply definable characters. Plate VII, fig. 1, illustrates the sexual pieces, the figure given in my Revision having been made, as now appears, from an imperfect specimen.

Noctua treatii Grt.

Since I wrote in 1890 this species has turned up in several places and is now well represented in a number of collections. To the locality given in my catalogue must be added Jefferson, N. H.; Adirondack Mountains, N. Y.; Central Maine and Calgary, Canada. None of the examples seen approaches in size the specimen referred to in my Revision and now in the U. S. National Museum.

Noctua exuberans, sp. nov.

Ground color gray, varying from reddish to almost ashen, more or less irrorated. Head without markings; palpi deep brown at the sides. Collar with the lower half deep sienna brown. Thorax otherwise without markings. Primaries with the median lines obsolete, except on costa where the basal, t. a. and t. p. lines are indicated by black spots. A median shade is indicated by a brownish cloud. In one

specimen it is possible to trace a vague t. a. line part way across the wing. The s. t. line is indicated but is broken, a little paler, principally marked by the slightly darker terminal space and toward the costa also by a dusky preceding cloud. The orbicular is wanting in the specimens before me. The reniform is small, kidney shaped, black; but with indefinite outlines and incomplete superiorly. Secondaries whitish, iridescent, becoming smoky at the margin, where there is a brown terminal line setting off the white fringes. Beneath whitish, a little powdered at the margins, the primaries a little darker than the secondaries, and in one specimen almost smoky. Expanse, 1.60 inches = 40 mm.

Habitat : Glenwood Springs, Colorado, in July; Dr. Barnes.

Three male specimens are before me, each differing a little in color; but otherwise very similar. The species is allied to *lubricans*; but is larger and with much less trace of the ordinary markings, while on the other hand the reniform is much more distinct. In most of the examples of *lubricans* the transverse lines may be made out. In this species there is no appearance of them except on the costa. Two of the specimens are uniform in color, although different in shade. The third specimen is ashen gray along the costa and in the terminal space, while the rest of the wing has a reddish cast. The species reminds one somewhat of *incivis*, but the wing form is different.

In sexual characters the insect agrees in general with the group in which I have placed it, and is one of those showing no very characteristic features. It is represented in Plate VII, fig. 10.

Noctua bolteri, sp. nov.

Ground color red with a violet tinge. The markings rusty brown and black. The vestiture of the head and thorax is defective, hence it is impossible to say whether or not they are maculate. Basal line geminate, black, emphasized by brown scales, continuing to the submedian vein and from that point obliquely outward to the inner margin. At this point there is an oblique brown shade which marks the middle of the lower half of the median space. In the cell there is, almost midway between the basal and t. a. line, an upright black mark which is inwardly margined by yellowish scales. T. a. line geminate, the outer part black, the inner brown; included space marked with yellow scales. As a whole the line is nearly upright to the submedian vein and then with a strong outcurve to the inner margin. T. p. line geminate, lunulate, with a square outward bend over the cell, then incurved below; made up of black lunules followed by yellow scales and outwardly margined by a rusty brown, rather broad and nearly even line. S. t. line yellow, irregular, forming a W on veins 3 and 4, preceded by a distinct brown shade which becomes blackish toward the costa. A series of black terminal lunules, which are outwardly marked with yellow. There is a brown, irregular median shade. Claviform large, filling nearly the entire space between the median and submedian veins; outlined by black scales within which is a yellow line, and the whole is filled with brown. Orbicular large, oval, incomplete above, outlined by black scales within which is a yellow annulus. Reniform very large, broad, hardly kidney shaped, outlined with black scales, then annulate with yellow; the center with a whitish lunule. Secondaries smoky gray, the

fringes almost white, a vague trace of a discal lunule showing from below. Beneath primaries pale, powdered along the margin with carmine scales, and with a vague discal spot. Secondaries with a more distinct discal spot and incomplete outer line. Expanse, 1.32 inches = 33 mm.

Habitat: Las Vegas, New Mexico, July 11th.

A single female specimen was received from Mr. A. Bolter, after whom I have named this most remarkable insect. It is totally unlike any other of the described species in every respect and at first sight recalls some of the *Plusioid* forms allied to *Diastema*; yet it has all the characters of the genus *Noctua* to which I refer it, and in this genus it stands by itself. Its occurrence in New Mexico contradicts the general distribution of the genus which I have elsewhere referred to, and the male may present characters which will induce the reference of the species to some other genus.

Noctua plebeia, sp. nov.

Ground color a dirty clay yellow, with blackish powderings which give it a sordid appearance. Head and thorax without obvious markings. The tip of the collar paler, the general shading of the thorax a little darker than the primaries. There is an obvious divided anterior and posterior tuft. All the markings are traceable, though all are more or less incomplete. Basal line geminate, black, extending to the submedian vein. T. a. line geminate, black, incomplete both parts of the line almost equally distinct; as a whole with a very slight outcurve. T. p. line blackish, powdery, geminate, very even, feebly bisinuate. S. t. line consisting of a series of very black spots which may become partly united into a broken line, and outwardly margined by a few yellowish scales. There is a series of brown or blackish terminal lunules, beyond which is a yellowish line at the base of the fringes. There is a diffuse median shade which is hardly marked on the costa; but is obvious below the median vein. The claviform is outlined by brown and black scales and filled with brown. Orbicular moderate in size, oval, rather irregular, outlined by pale scales, black filled. Reniform large, kidney shaped, outlined by yellowish and brown scales, and filled with black. The space between the ordinary spots is brown. Secondaries smoky fuscous, the fringes considerably paler. Beneath, smoky, powdery, the primaries darker; the secondaries with a very distinct large discal spot and a broad median line. On the primaries similar marks are traceable. Expanse, 1.40 to 1.60 inches = 35 to 40 mm.

Habitat: Vancouver, August 14th; Livingston. British Columbia; California.

I have two males and one female, and have seen other specimens; one at least from Oregon, and I think also a specimen or two from Washington. The California specimen is the only female and is, I believe, from some point in the Sierra Nevada Mountains. This species is very well marked and is unlike any others of those that are described. In a general way it is allied to *baja*, or, as it must now be known, *smithii*,

but the most obvious difference and the one that will enable this species to be readily recognized is in the black filled ordinary spots. In this character the species is unique. The insect gives the impression, somehow, of a dirty creature.

The male parts are very simple, consisting of a single upright corneous process on a broad triangular harpe.

Setagrotis elata, sp. nov.

Ground color ash gray, varying in general shade from a yellowish to a bluish tinge. Head and thorax without markings of any kind. Primaries with all the markings obscured and very feebly traceable. The median lines are always visible as geminate black costal spots, but beyond that they are only vaguely indicated. In a general way and so far as can be indicated the t. a. line seems to be a little outcurved between the veins, and as a whole a little outcurved in its course. The t. p. line is even, with an even outcurve over the cell and an almost equally even incurve. The s. t. line is whitish, irregular, broken, well defined by a blackish preceding shade and by the somewhat darker terminal space. The claviform is merely indicated by a few black scales. Orbicular round, of moderate size, incompletely defined by a few black scales, within which is a somewhat more distinct circlet of yellowish scales. The reniform is moderate in size, also incompletely outlined by black and yellow scales, the lower portion filled with blackish and forming quite a prominent feature in the markings of the wing. Secondaries in the male white, with a vague smoky outer margin and a narrow discal lunule. In the female more smoky, with a blackish outer margin and discal lunule. Beneath whitish, powdery, with a more or less marked outer line and discal spot on both wings. Expanse, 1.50-1.60 inches = 36-40 mm.

Habitat: Colorado.

I have three specimens, two males and one female, received from Professor C. P. Gillette, and numbered 565, 2610 and 2732. The specimens differ considerably, and yet resemble each other quite closely. The female is the larger and much the darker. All the specimens agree in showing the black filled reniform and pale, dark bordered s. t. line. as the only prominent features in the wing.

EXPLANATION OF PLATE VII.

- | | | | |
|------|-----|----------------------|----------------------------------|
| Fig. | 1. | Harpe and clasper of | <i>Noctua inopinatus</i> , male. |
| " | 2. | " " | <i>Noctua rubifera</i> , male. |
| " | 3. | " " | <i>Noctua cynica</i> , male. |
| " | 4. | " " | <i>Noctua jucunda</i> , male. |
| " | 5. | " " | <i>Noctua calgary</i> , male. |
| " | 6. | " " | <i>Noctua rosaria</i> , male. |
| " | 7. | " " | <i>Noctua rosaria</i> , male. |
| " | 8. | " " | <i>Noctua esurialis</i> , male. |
| " | 9. | " " | <i>Noctua hospitalis</i> , male. |
| " | 10. | " " | <i>Noctua exuberans</i> , male. |

All the figures are drawn with a camera lucida and to the same scale.

NEW SPECIES OF NOCTUIDÆ FROM TROPICAL AMERICA.

BY WILLIAM SCHAUS.

Noctua herculeana, sp. nov.

Head and thorax reddish brown. Abdomen gray. Primaries at the base violaceous, limited by a geminate velvety black basal line; the antemedial line partly geminate, oblique and not reaching the inner margin, most heavily marked on the costa; the space before the antemedial line grayish; the median space violaceous brown; orbicular indistinct, partly surrounded by black; the reniform large, diffuse, whitish gray; the postmedial line fine, geminate, followed by a row of small spots; the postmedial space light brown, followed by the broad dark violaceous brown margin. Secondaries smoky brown. Expanse, 60 mm.

Habitat: Trojes, Mexico.

Agrotis aureolum, sp. nov.

Head golden yellow. Collar and thorax concolorous, dark reddish brown. Primaries similar to *Agrotis malefida* Gn, but browner and the postmedial line more distinct. Secondaries pure white. Expanse, 40 mm.

Habitat: Castro, Parana.

Agrotis perotensis, sp. nov.

Body light reddish brown. Primaries light reddish brown; the lines very fine and slightly darker; basal and antemedial lines somewhat oblique and hardly wavy; the postmedial very slightly curved beyond the cell and marked by minute points on the veins; subterminal line wavy, paler than the ground color and inwardly shaded with darker brown especially towards the costa; orbicular large, very oblique; reniform large, kidney shaped, both spots olive brown, surrounded by a pale line. Secondaries white with a slight reddish brown tinge; fringe darker; discocellular well marked. Expanse, 41 mm.

Habitat: Las Vigas, on the Cofre de Perote. Elevation 10,000 ft.

Agrotis oaxacana, sp. nov.

Body very dark brown, almost black. Primaries blackish brown; lighter brown along the basal half of costa to below cell; the antemedial and postmedial lines geminate, indistinct; a subterminal light brown shade crossed on veins 4 and 5 by black streaks; claviform very small; orbicular and reniform hardly perceptible; some light brown spots at the base of the fringe. Secondaries smoky black, whitish towards the base; fringe golden. Expanse, 39 mm.

Habitat: Oaxaca, Mexico.

I have only received 2 ♀ ♀ of this distinct species.

Agrotis molepa, sp. nov.

♂. Antennæ pectinated. Head and thorax light reddish brown. Abdomen yellowish white. Primaries light reddish brown; antemedial line replaced by three black spots, on costa, median and submedian veins; postmedial line punctiform, black, hardly curved on costa and parallel with outer margin; reniform small, black. Secondaries pearly white. Expanse, 36 mm.

Habitat: Castro, Parana.

What I consider as the ♀ of this species has the primaries dark reddish brown with transverse black striæ, making the costal margin much darker; orbicular represented by a black point; reniform small, black. Secondaries white, thinly speckled with black. Expanse, 42 mm.

Habitat: Castro, Parana.

Amathes gasiva, sp. nov.

Head and thorax dark gray, the scales tipped with white, and a black central line on the collar. Abdomen brown with a subdorsal basal tuft of dark gray scales. Primaries dark gray; the basal line black, indistinct; the antemedial line black, outwardly curved between the veins; the postmedial inwardly curved between the veins, more narrowly black, but very distinct and followed by a line of dark scales; the subterminal wavy, lighter gray, preceded and followed by a brownish shade; the veins on outer margin blackish; the claviform outlined in black; the orbicular and reniform large, tinged with brown and irregularly outlined with black; a broad dark brown median shade crossing the wing between the spots. Secondaries brown, whitish towards the base; a terminal white line. Underneath light grayish with a minute discal spot and postmedial line. Expanse, 28 mm.

Habitat: Las Vigas, Mexico. Elevation 10,000 ft.

Strongly resembles *A. tesselloides* Grote.

Amathes yaxcaba, sp. nov.

Head and thorax gray, the anterior portion of collar velvety black. Abdomen light grayish brown. Primaries gray, minutely speckled with black; a basal black line not reaching the inner margin; the antemedial line diffusely angulate, irregular, sometimes only visible on the costal margins; the postmedial represented by a black spot on costa; the subterminal most indistinct, forming a faintly darker shade near costa; reniform indistinctly and unevenly outlined in black. Secondaries white, with a fine terminal brown line. Underneath primaries and costal margin of secondaries grayish. Expanse, 33 mm.

Habitat: Orizaba, Mexico.

This species is allied to *A. lubricans* Gn, and the ♀ is easily distinguished by the white secondaries.

Mentaxya butleri, sp. nov.

Body light gray. Primaries silvery gray with all the markings very indistinct; a basal interrupted line; a geminate antemedial and a geminate postmedial line

darker gray; a median and a subterminal reddish brown shade; the orbicular and reniform finely outlined in dark gray. Secondaries white, the margins faintly shaded with brown. Expanse, 30 mm.

Habitat: Jalapa, Mexico.

There is a specimen of this species in the B. M. from Rio Janeiro.

***Mentaxya biformis*, sp. nov.**

Head and thorax gray with a reddish or black spot anteriorly on the collar. Primaries gray, crossed by numerous transverse brownish striz; a minute dark basal spot on the costa; the antemedial line straight, inwardly oblique, crossing the clavi-form which is represented by a small black spot; outer line curved beyond the cell, indistinct; orbicular absent; reniform small, reddish brown. In the ♀ the lines and reniform are also absent. Secondaries pearly white in the ♂, the margins shaded with brown in the ♀. Expanse, 33-36 mm.

Habitat: Sao Paulo, S. E. Brazil.

I may here mention that *Mentaxya lucilla* Btl., is a synonym of *A. messium* Gn.

***Anicla mahalpa*, sp. nov.**

Head and thorax light gray or pale buff, the anterior portion of thorax sometimes reddish or velvety brown. Primaries light gray or pale buff with transverse darker striz, and thinly speckled with black; a few reddish scales in the cell and subterminally; the outer margin irregularly dark gray; a terminal row of dark points; three dark points on the costa; orbicular absent; reniform spotted and surrounded by small black sagittate marks. Secondaries and fringe pearly white. Expanse, 38 mm.

Habitat: Castro, Parana.

The peculiar reniform and pearly white secondaries distinguish this species from *A. incivis* Gn., to which it is otherwise allied.

***Carneades colima*, sp. nov.**

Head and thorax brownish yellow. Primaries brownish yellow, brightest along the costal margin and at the base; two small dark brown basal spots, below the costa and median vein; antemedial line dark brown, angular; postmedian line punctiform on the veins, connected by a lunate shade; the subterminal very fine, indistinct; the extreme margin brownish with a terminal row of black points; orbicular represented by a brownish patch; reniform large, kidney shape, brownish, circled with yellow. Secondaries white with an interrupted dark terminal line. Expanse, 41 mm.

Habitat: Colima, Mexico.

***Carneades cofrensis*, sp. nov.**

Head and thorax grayish; collar with a black posterior line. Abdomen light brown. Primaries light green, mottled with brown; basal and antemedial lines white, connected by a brown patch below the median vein; some brownish shades on the costa and a large white spot above the median vein; space between spots and before

orbicular brown; claviform large, brown; orbicular greenish, speckled with brown and broadly circled with white; reniform large, indistinctly outlined and shaded with brown and partly margined with white; postmedial line brown, denticulate, outwardly shaded with white and outwardly preceded by a brown shade below the reniform; subterminal indistinct, forming a broad shade; a terminal row of triangular black spots; fringe gray. Secondaries light gray, with a darker terminal line and the discal spot of the underside clearly visible. Expanse, 35 mm.

Habitat: Las Vigas on the Cofre de Perote, Mexico. Elevation 10,000 feet.

Polyphænis psittacea, sp. nov.

Head and thorax bright green. Abdomen brown with a few subdorsal greenish tufts. Primaries bright green; the lines brown, geminate; the antemedial irregular wavy, the basal straight, the postmedial crenulate; the subterminal shade heavy and irregular, brown, followed apically by some brownish spots; a terminal crenulate black line. Secondaries reddish brown, paler towards the base; an interrupted darker terminal line; the fringe partly green. Underneath primaries reddish brown; secondaries lighter brown, with a discal spot, postmedial line, and broad marginal band all reddish brown. Expanse, 35 mm.

Habitat: Aroá, Venezuela. Jalapa, Mexico.

Polyphænis aurea, sp. nov.

Head and thorax bright green. Abdomen golden yellow with a brownish subdorsal line. Primaries bright green; basal marks blackish, irregular, antemedial line brown, geminate from costa to median vein only, then single, fine angular to inner margin; postmedial line fine, black, wavy, deeply curved beyond the cell, and bordering a large brown median space on the inner margin; vein 6 black, from postmedial line to outer margin; subterminal shade only visible at apex. Secondaries golden yellow with a large apical reddish brown spot. Primaries below with the basal half and inner margin golden yellow, otherwise dark brown; secondaries below golden yellow with a broad brown band on the apical half of the outer margin, and a small brown spot on the costal margin. Expanse, 40 mm.

Habitat: Aroá, Venezuela.

Mamestra zobira, sp. nov.

Body dark brown, paler dorsal tufts on the abdomen. Primaries dark violaceous brown, the lines fine, black; the basal line outwardly, the antemedial line inwardly shaded with reddish brown; the postmedial line crenulate, outwardly shaded with reddish brown; the subterminal broken into an irregular row of reddish brown spots, inwardly shaded with black, the spot at inner angle being the largest; a few minute pale spots on the costa; the orbicular absent; the reniform indistinct, mottled with reddish brown scales. Secondaries whitish in the disc, otherwise black. Expanse, 31 mm.

Habitat: Orizaba, Mexico. Jamaica, W. I.

Mamestra janeira, sp. nov.

Body dull brown. Primaries reddish brown, darker along the costa and outer margin; the lines fine, black, basal line geminate, angular; antemedial line geminate, wavy; postmedial line crenulate, followed by points on the veins; subterminal line punctiform outwardly shaded with yellowish brown; orbicular large, dark, finely outlined in black and fusing with the darker costal margin; reniform light reddish brown, partly outlined in black, with a minute white spot in its lower portion; a dark median shade curved, and connected to the lower portion of the reniform by a dark line. Secondaries dull brown; underneath paler with a postmedial dark wavy line and a large black discal spot on the secondaries. Expanse, 35 mm.

Habitat: Rio Janeiro.

Mamestra trocas, sp. nov.

Head and thorax light dull brown; abdomen paler. Primaries light brown, lines darker, very fine and indistinct; the basal and antemedial lines wavy and slightly curved; a dark median shade angled below the reniform; the postmedial geminate, widely apart, broken, almost punctiform; a subterminal row of small black spots, outwardly shaded with white towards the apex; a yellowish white spot at the inner angle; the spots faintly outlined in black, the reniform containing a few yellowish scales. Secondaries light smoky brown. Expanse, 33 mm.

Habitat: Castro, Parana.

This species is closely allied to *M. dotata* Druce.

Mamestra baruna, sp. nov.

♂. Antennæ pectinated, yellow. Head and thorax reddish brown; abdomen grayish brown; anal hairs rufous. Primaries dark reddish brown, the lines indistinct; the antemedial outwardly curved between the veins; a postmedial and a subterminal row of black points; the costal margin and fringe reddish; the orbicular minute, circled with white; the reniform large quadrate, whitish gray. Secondaries pale yellowish with an indistinct marginal shade. Expanse, 40 mm.

Habitat: Castro, Parana.

The ♀ has the primaries rich reddish brown, the veins somewhat darker; the spots as in the ♂. Secondaries brownish black with reddish fringe.

Mamestra subpicta, sp. nov.

Body dark gray; abdomen rufous beneath. Primaries above dark blackish gray, the lines black and indistinct; some mottling from the base to the antemedial line, and the space between the postmedial and subterminal lines, light brown; a terminal row of black points and some brownish spots on the fringe; orbicular small, reniform, large, both light brown circled with black. Secondaries very dark brown, the fringe whitish. Underneath the primaries light rufous along the costa and subterminal space; the cell and apical half of outer margin black; a wavy black postmedial line. Secondaries below whitish, thickly mottled with reddish, scales towards the apex; a

large black discal spot, and the commencement of a broad black antemedial band ; a wavy black postmedial line. Expanse, 22 mm.

Habitat : Orizaba, Mexico.

Hecatera marmica, sp. nov.

Head and collar whitish speckled, with black. Thorax dark gray. Abdomen light brown. Primaries blackish gray ; the lines indistinct ; the basal line followed by a broad white band from the costa to the submedian vein ; a broad subterminal white shade interrupted above angle by a dark spot, occupying inner margin from the postmedial line to the angle itself ; fringe dark gray, spotted with white ; postmedial line denticulate ; orbicular dark, hardly discernible ; reniform large, mottled gray and white. Secondaries white with the costal margin and a terminal line brownish. Expanse, 30 mm.

Habitat : Oaxaca, Mexico.

Hadena lignaris, sp. nov.

Head and collar light brown : posterior portion of collar and two transverse lines reddish brown. Thorax reddish brown. Abdomen light brown. Primaries reddish brown with numerous longitudinal light and dark brown lines ; the transverse lines hardly perceptible, light brown and very irregular ; spots small, indistinct with a central dark point. Secondaries brown, semitransparent towards the base ; a discal spot. Expanse, 34 mm.

Habitat : U. S. Colombia.

This species is allied ♂ *Hadena ordinarius* Btl., and *H. patina* Harv. Both *ordinarius* and *patina* are common in Mexico and may eventually prove to be the same species.

Alibama scuroba, sp. nov.

Head and thorax blackish brown ; abdomen lighter brown. Primaries blackish brown with the markings very indistinct ; the lines fine, velvety black ; the basal line angular, the antemedial outwardly curved between the veins, the postmedial inwardly curved ; the subterminal shade narrow, brown, followed by a dusky dark gray marginal shade ; the spots finely outlined in black. Secondaries pearly white with a terminal dark line and some postmedial clusters of dark scales on the veins. Expanse, 30 mm.

Habitat : Sao Paulo, S. E. Brazil.

The female has the outer half of the secondaries black, the base white. Expanse, 36 mm.

This species bears a strong resemblance to the dark forms of *Alibama terens* Wlk.=*A. pulchra* Mösch, but the secondaries are very distinct.

Oligia niveiplaga, sp. nov.

Head, collar and patagiae light reddish brown ; thorax white ; abdomen brown. Primaries light brown ; the inner margin white, the upper portion of this white space

circular ; the lines fine, black, indistinct, not crossing the white portion of the wing ; orbicular and reniform finely outlined in black ; a broad black streak from the cell across lower portion of reniform to the outer margin ; the subterminal shade white, indistinct. Secondaries white, the apex and adjoining portion of outer margin brown ; a minute discal spot beneath. Expanse, 27 mm.

Habitat : Aroa, Venezuela.

Oligia apicalis, sp. nov.

Head and collar grayish yellow ; thorax reddish gray. Primaries reddish gray speckled with black, forming indistinct lines ; the apical portion of the wing beyond the cell and from inner angle dark brown ; on the inner margin close to angle a reddish brown shade, above which the indistinct subterminal shade of reddish brown crosses the dark portion of the wing ; an apical reddish gray spot. Secondaries brown in the ♀, paler at the base in the ♂. Expanse, 32 mm.

Habitat : Aroa, Venezuela ; Castro, Parana.

Oligia thoracica, sp. nov.

Head, collar and thorax light reddish brown, the scales tipped with white ; pata-gia dark velvety brown. Abdomen light brown. Primaries brown, slightly mottled with gray ; the basal line black, outwardly shaded with white ; the antemedial line black, forming three curves and outwardly oblique, the costal portion outwardly shaded with white ; the postmedial line white on costa, then finely black, outwardly shaded with white, on which some minute black points are visible to the inner margin ; a dark brown shade descends from the costa on the inner side of reniform and joins the postmedial line at vein 2 ; a black space on the costa beyond the postmedial, and a dark streak between veins 4 and 5 ; the subterminal shades indistinct, yellowish, followed by some grayish shades ; the orbicular round, pure white ; the reniform brown, indistinct, surrounded by darker shadings. Secondaries whitish with a marginal brown band ; the discal spot and postmedial line of the underside distinctly visible. Expanse, 30 mm.

Habitat : Sao Paulo, S. E. Brazil.

Oligia cadema, sp. nov.

Head and collar reddish brown, thorax gray. Abdomen grayish brown. Primaries brownish gray, palest beyond the postmedial line ; basal line indistinct, pale ; antemedial line light grey, forming three large curves and outwardly oblique ; an inwardly oblique dark shade from the antemedial at the mediah vein to the base of the inner margin ; the postmedial line geminate, finely crenulate, the space within partly lilacine ; a darker shade to the outer margin between veins 3 and 4 ; the subterminal shade indistinct, gray, shaded on either side with brown ; a very dark line in the cell between the spots ; orbicular punctiform, white ; reniform large, oblique, grayish, outlined with black. Secondaries in both sexes pearly white, the apex and part of the outer margin smoky ; the discal spot and punctiform postmedial brown line of the underside visible above. Expanse, 27 mm.

Habitat : Castro, Parana. Described from seven specimens showing variability.

Trachea paranica, sp. nov.

Head and collar brownish gray. Thorax mottled olive, gray, black and white. Abdomen dark gray. Primaries olive green, thickly mottled with lilacine gray, all the veins being of the latter color; a broad median band being most devoid of mottling; the basal line black, broadly shaded with white outwardly; the antemedial line black, curved between the veins and inwardly bordered with white; the postmedial crenulate, indistinct, slightly shaded outwardly with white; the subterminal broad, white, and very wavy, outwardly shaded with black at the middle of the inner margin and above the inner angle; a terminal row of black points; the margin lilacine gray; orbicular small, grayish; reniform dark circled, indistinct. Secondaries whitish at the base, otherwise grayish black. Expanse, 35 mm.

Habitat: Castro, Parana.

Praina, gen. nov.

Eyes naked. Antennæ pectinated. Fore tibiæ without spines; mid tibiæ with three terminal spines; hind tibiæ with two pairs of spines. Primaries with outer margin rounded; vein 8 and 9 anastomosing to form the areole. Secondaries with veins 3 and 4 slightly stalked. Abdomen long, stout, conical.

Praina radiata, sp. nov.

Head and thorax dark velvety brown; a pale line between antennæ and posteriorly on collar. Thorax pale buff; patagiæ with a broad dark brown band. Abdomen light brown. Primaries pale buff; a broad brown space below subcostal vein, and also below median vein; the submedian shaded on either side with brown; the interval spaces on the outer margin dark brown. Secondaries yellowish white with a terminal brown line. Underneath primaries and costal margin of secondaries brown. Expanse, 32 mm.

Habitat: Castro, Parana.

Leucania oriza, sp. nov.

Primaries light pinkish gray with a slightly darker central shade from the base to the outer margin; a few black scales scattered over the wing; the median nervure between veins 2 and 3 faintly white, above which there is a minute black point; a terminal row of black points. Secondaries smoky gray, whitish at the base. Expanse, 30 mm.

Habitat: Orizaba, Mexico.

Leucania jaliscana, sp. nov.

Head and abdomen ochreous; collar light reddish brown with three transverse gray lines. Primaries light ochreous, the subcostal and median veins slightly grayish; the fringe and a triangular shade on the outer margin dark reddish brown; a light reddish brown shade at the end of the cell, and a white spot on the median vein; some antemedial clusters of dark scales below the median vein; a postmedial row of black points. Secondaries white with a terminal fine brown line; the base of the fringe ochreous. Expanse, 32 mm.

Habitat: Guadalajara, Mexico.

Leucania oaxacana, sp. nov.

Head ochreous gray. Collar and thorax light gray speckled with black. Primaries light gray, the veins faintly whitish, black scales scattered over the wing, thickly so along the median vein on which is a white spot containing a black point; a postmedial row of black spots; a terminal row of black spots. Secondaries whitish gray, the veins and a terminal line brownish. Expanse, 33 mm.

Habitat: Oaxaca, Mexico.

Leucania misteca, sp. nov.

Head and thorax reddish gray. Primaries pinkish gray speckled with black; the outer margin darker with long fine black streaks between the veins; a dark central shade from the base to beyond the cell; a minute whitish spot on the median vein; a postmedial and a terminal row of black points. Secondaries white; a terminal row of black spots between the veins; the apex and base of the fringe smoky. Expanse, 35 mm.

Habitat: Oaxaca, Mexico.

Leucania orizaba, sp. nov.

Body reddish gray; the collar posteriorly dark gray, anteriorly with two fine black transverse lines. Primaries light reddish gray, the veins paler, and darker longitudinal streaks between the veins; some black points below the median vein; the postmedial row of black points very much curved, inwardly oblique, geminate from beyond the cell; a whitish speck on the median vein preceded and followed by a broad black streak; a terminal row of black points; a subapical dark shade on the outer margin. Secondaries grayish brown, paler at the base; the base of the fringe yellowish. Expanse, 35 mm.

Habitat: Orizaba, Mexico.

Atethmia targa, sp. nov.

Head and thorax brown, the scales tipped with white. Abdomen rufous brown. Primaries brown powdered with whitish scales, the lines whitish; the basal line almost invisible; the antemedial line somewhat oblique outwardly and shaded with darker brown especially on the basal side; a median brownish shade crossing the reniform which is indistinct; the postmedial line strongly angled beyond the cell and slightly curved inwardly to the inner margin; the subterminal line slightly wavy; the orbicular represented by a brownish dot. Secondaries silvery white; a broken terminal black line. Expanse, 24 mm.

Habitat: São Paulo, S. E. Brazil.

Atethmia editha, sp. nov.

Head and thorax light brown, the scales tipped with white; the collar edged with white. Primaries brown thickly speckled with white scales, the veins finely whitish; all the transverse lines fine whitish; the basal line indistinct; the antemedial line curved on costa, then outwardly oblique to inner margin; the postmedial line the heaviest and followed by a whitish shade, this line and the subterminal being parallel with the outer margin; a terminal lunular brown line; the fringe mottled brown and

gray; the orbicular and reniform distinct and dark, both finely edged with white. Secondaries silvery white in the ♂, smoky in the ♀. Expanse, 30 mm.

Habitat: Castro, Parana.

***Atethmia paulensis*, sp. nov.**

Body pale fawn color. Primaries silvery fawn color crossed by an antemedial, postmedial and subterminal line; these three lines are fine, brown, and angled near the costa; the fringe brownish; the spots not visible. Secondaries white, the fringe and margins narrowly silvery fawn color. Underneath fawn color with traces near the costa of a postmedial and subterminal line; a minute spot at the end of the cell on the primaries. Expanse, 32 mm.

Habitat: Sao Paulo, S. E. Brazil. This species is nearly allied to *A. rectifascia* Grote, from the United States.

***Dacira ranapa*, sp. nov.**

Palpi brown tipped with white. Head white. Collar brown with some white scales posteriorly. Thorax dark brown. Abdomen light brown with a subdorsal white tuft on the first segment. Primaries above with the base dark brown, limited by the antemedial lighter brown wavy line; the median space white; the orbicular and reniform indistinctly outlined in gray, the latter crossed by a smoky brown band, which is slightly oblique from the costa and then forms a single outward curve to the inner margin; the postmedian line denticulate, velvety brown; a large dark brown patch from the reniform to the postmedian line; a brownish patch on the costal margin beyond the postmedian and not reaching the apex; the outer margin yellowish shaded with dark brown on the extreme margin; fringe dark brown; the subterminal represented by a few scattered dark brown scales. Secondaries whitish with the outer margin broadly grayish brown. Underneath whitish; the outer half of the primaries brownish; the secondaries with a wavy, postmedial line, a small discal spot and some grayish scales along the costal margin. Expanse, 23 mm.

Habitat: Castro, Parana.

***Cucullia lilacina*, sp. nov.**

Head and anterior portion of collar dark gray; collar otherwise and thorax light gray; abdomen gray with the dorsal tufts dark brown. Primaries lilacine gray without the usual longitudinal streaks; the base, inner margin, and heavy streak above the inner angle, dark brown; the fringe on the inner margin partly black; the apical portion beyond the cell light reddish brown, becoming darker on the costa, where there are three small white spots; the orbicular of the ground color finely outlined in black; the reniform light reddish brown, indistinct; a blackish shade from the costa, between the spots not reaching the median vein. Secondaries sordid white, the veins and outer margin brownish. Expanse, 40 mm.

Habitat: Orizaba, Mexico.

***Cucullia strigata*, sp. nov.**

Head very dark gray; collar and thorax lighter gray of the same shade as *C. postera* Gn; abdomen still paler, with dark gray dorsal tufts. Primaries same color

as thorax; same general shadings as in *C. convexipennis* Grote, but darker; a long basal streak below the median vein; another dark streak starting on the median vein at a third from the base and continuing along vein 5 to nearly the outer margin. Secondaries sordid white at the base, the outer margin broadly dark brown. Expanse, 45 mm.

Habitat: Jalapa, Mexico. This species bears a similarity to *C. convexipennis* Grote, but the color is quite different.

***Chloridea distincta*, sp. nov.**

Head and thorax light olive green. Abdomen brownish. Primaries light olive green; a brown line inwardly shaded with paler green from close to the apex on the costal margin to nearly the middle of the inner margin. Secondaries brown in the ♀, the fringe white. Secondaries in the ♂ white with a broad brown margin. Underneath primaries brown, with the costa, apex and outer margin gray. Secondaries grayish with a large brown space at anal angle; a postmedial dark line and discal spot. A discal spot also on underside of primaries. Expanse, 32 mm.

Habitat: Sao Paulo, S. E. Brazil.

***Acontia obscura*, sp. nov.**

Head, collar, thorax below, and abdomen of the ♂ ventrally, also the tibiæ, bright orange; tarsi black; the hind tibiæ black at points. Abdomen and thorax dorsally dark greenish black. Primaries dark greenish black. Secondaries bluish black. Expanse, 36 mm.

Habitat: Guadalajara, Mexico.

***Acontia trilinea*, sp. nov.**

Head, collar and body beneath, orange yellow. Thorax orange, the patagiæ bordered with greenish black; abdomen dorsally black. Primaries olive green; the costal vein broadly yellow to nearly the apex; the median vein narrowly yellow, this color extending for a short distance on veins 3 and 4; the submedian vein broadly yellow. Secondaries bluish black. Expanse, 34 mm.

Habitat: Jalapa, Mexico. Possibly an extreme form of *A. obscura* Schs.

***Tarache pyralidia*, sp. nov.**

Head and collar light rufous. Thorax dark brown. Abdomen light brown. Primaries gray shaded with dark brown on the basal third; the outer margin broadly light rufous, inwardly shaded with brown; the fringe brownish. Secondaries whitish, faintly smoky along the outer margin. Expanse, 19 mm.

Habitat: Oaxaca, Mexico.

***Tarache axendra*, sp. nov.**

Head and collar dark olivaceous green. Thorax black. Abdomen brown. Primaries dark olivaceous brown; traces of antemedial and postmedial black lines, beyond the latter clusters of steel gray scales extending toward the apex; similar

clusters on the inner margin ; three large white spots on the costal margin, and a whitish patch close to anal angle ; the extreme outer margin and fringe steel gray ; a terminal row of black spots. Secondaries brown, darkest on the outer margin. Underneath the secondaries are fuscous with a terminal brown shade and some dark spots on the costal column. Expanse, 21 mm.

Habitat : Guadalajara, Mexico.

Tarache mizteca, sp. nov.

Head and thorax dark steel gray. Collar whitish. Abdomen yellowish, Primaries with the anterior half olivaceous and three large spots on the costal margin ; the inner margin dark steel gray, with traces of an antemedial and postmedial dark line ; a large white spot at the anal angle containing some clusters of grayish scales and a terminal interrupted black line. Secondaries white with the outer margins brownish yellow, especially at the apex. Underneath yellowish, the dark portions of the primaries visible. Expanse, 25 mm.

Habitat : Oaxaca, Mexico.

Tarache jaliscana, sp. nov.

Head black. Collar and thorax white. Abdomen brown above, white below. Primaries white, the marginal third of the wing violaceous brown shaded inwardly with olive green ; some terminal patches of lilacine scales, and a double grayish terminal line ; the basal third of the costal margin steel gray. Secondaries white in the ♂ with smoky margins, entirely brown in the ♀. Expanse, 35 mm.

Habitat : Guadalajara, Mexico.

Tarache duenna, sp. nov.

Head creamy white. Thorax grayish. Abdomen dark gray with transverse whitish lines. Primaries violaceous, mottled with brown and black scales ; a large white spot on the centre of the costal margin, inferiorly bordered with olivaceous green ; some whitish scales at the base and also on the outer margin below the apex. Secondaries yellowish white, the outer margin smoky. Expanse, 21 mm.

Habitat : Sao Paulo, S. E. Brazil.

Eustrotia bertha, sp. nov.

Head and collar grayish. Prothorax fawn color. Abdomen light brown. Primaries with the basal half creamy fawn color shaded with longitudinal brown streaks ; the outer half lilacine gray with a subterminal white line preceded by some whitish shades ; a few apical dark brown streaks. Secondaries white in the ♂ with a terminal brown line, and minute spot in the cell ; slightly smoky at the apex. Secondaries brown in the ♀. Expanse, 20 mm.

Habitat : Sao Paulo, S. E. Brazil.

Xanthoptera auruda, sp. nov.

Body and primaries bright yellow ; a broad transverse orange line, curved beyond the cell and inwardly oblique to the middle of the submedian vein ; the orbicular and reniform represented by orange dots ; a similar dot below the orbicular ; a terminal

brown line ; the fringe dark gray. Secondaries pale yellowish, shaded with brown on the outer margin. Expanse, 20 mm.

Habitat : Sao Paulo; S. E. Brazil.

***Galgula cuprea*, sp. nov.**

Head and abdomen brown. Thorax violaceous. Primaries violaceous ; the outer margin broadly coppery red ; the antemedial line irregular, olivaceous, finely bordered with brown ; the postmedial line straight, olive green, divided by a fine brown line and inwardly shaded with dark brown ; a small triangular olivaceous patch resting on the postmedial line beyond the cell and having a white line at its base. Secondaries brown. Expanse, 18 mm.

Habitat : Castro, Parana.

***Galgula castra*, sp. nov.**

Body and primaries light violaceous brown. The lines and spots as in *G. partita* Gn., but having in addition a distinct subterminal wavy line. The secondaries are yellowish white. Expanse, 25 mm.

Habitat : Castro, Parana. *Rivula mandane* Druce, of which I possess the type is merely one of the paler forms of *G. partita* Gn.

***Palindia hermura*, sp. nov.**

Body bright yellow, the collar and thorax outlined with white. Primaries above bright yellow ; a basal spot on the costa reaching the median vein, a broad and irregular antemedial band, and a spot on the costa at two-thirds from the base all lilacine faintly outlined with black ; at the anal angle a white line, shaded with lilacine stræ, extends to vein 5. Some small black apical costal spots ; a dark terminal line ; the fringe yellow tipped with silvery white. Secondaries whitish yellow shaded with bright yellow below the cell and along the margins ; on the outer margin a large spot, white and lilacine shaded with darker stræ. Underneath the wings are pale yellowish white. Expanse, 26 mm.

Habitat : Jalapa, Mexico ; Aroa, Venezuela.

***Dyomyx volcanica*, sp. nov.**

Body and wings lightish brown. Primaries with a fine dark velvety basal line from costa to the submedian vein ; a large irregular dark velvety brown triangular space from the costa to just above the inner margin, limited by the antemedial and medial lines which are pale ; an oval dark spot surrounded by a yellowish line and containing a fine blue point extends from this space to the inner margin ; the reniform large irregularly outlined with dark brown ; the postmedial line dark, angular, only visible near the costal margin ; a subterminal row of dark spots beyond which the outer margin is darker ; a terminal dark line preceded by a row of yellowish dots ; fringe dark brown. Secondaries with a terminal yellow line ; some brown and black scales on the outer margin surmounted by a cluster of bluish scales, above which two yellowish curved lines edged with black extend towards the cell and outer margin ; the fringe brown, towards the apex yellowish. Underneath brown with a postmedial large wavy line, and an antemedial line on the secondaries. Expanse, 43 mm.

Habitat : Orizaba, Mexico.

Dyomyx jonesi, sp. nov.

Body brown. Primaries above with the basal half dark reddish brown, the outer half lighter brown, separated by an oblique transverse line from the middle of the costal margin to the inner margin at two-thirds from the base; this line outwardly shaded with yellowish; just above the inner margin and close to this line a black spot surrounded by an orange line and containing a white dot; a dark basal line from the costa to the median vein; an oblique, dark antemedial line from costa to middle of inner margin; a postmedial line from costa to vein 3, where it is lost in a cluster of grayish scales which extend to the inner margin; the reniform large, outlined in dark brown; a subterminal irregular line of dark sagittate spots outwardly shaded with yellowish; a terminal dark gray line. Secondaries dark brown; a subterminal yellowish line surmounted near the anal angle by white and lilacine scales, above which an irregular yellowish line extends towards the cell and also towards the outer margin; a terminal gray line; the fringe partly yellowish. Underneath the wings are brown with a wavy dark postmedial line, and an antemedial shade on the secondaries. Expanse, 46 mm.

Habitat: Sao Paulo, S. E. Brazil.

Oræsia serpens, sp. nov.

Palpi, head and thorax dark brown. Abdomen light brown, laterally buff. Primaries above dark silky brown, the veins tinged with violaceous; two dark median transverse lines, the outer one the more conspicuous and forming a border to the tooth on the inner margin; a subterminal dark wavy line, not reaching the submedian vein and extending abruptly to the outer margin, forming an angle which encloses a small yellowish spot. Secondaries brown, fringe whitish. Underneath primaries dull brown with the costal margin whitish. Secondaries whitish, the outer margin dull brown, and a dull brown streak at the base of the costal margin; a small brownish discal spot whitish in the center. Expanse, 35 mm.

Habitat: Jalapa, Mexico.

Phrodita bilinea, sp. nov.

Palpi orange. Head, thorax and abdomen creamy white. Primaries above creamy white, the costal margin finely orange; a velvety black streak below the median vein, not quite reaching the outer margin; a black point in the cell followed by a black streak to the outer margin and which is crossed at the end of the cell by a whitish line. Secondaries white. Underneath primaries yellowish white, showing indistinctly the streak on the upper side; secondaries white. Expanse, 33 mm.

Habitat: Castro, Parana.

ON THE LARVÆ OF CERTAIN NEMATINÆ AND
BLENNOCAMPINÆ, WITH DESCRIPTION
OF NEW SPECIES.

BY HARRISON G. DYAR, PH.D.

Pontania borealis *Marlatt*.

Galls on *Salix sericea* at Plattsburg, N. Y.; solitary, smooth, exceeding the edge of the leaf, reaching from the midrib to beyond the margin and at varying distance from the base; not evenly divided by the leaf about one-third above, two-thirds below; shape pyriform or rounded; a few corky dots; color greenish, strongly red shaded, especially above; length, 8-9 mm., width about 6 mm., height, 5 mm. The substance is thick, fleshy, white with pink lines.

Larva.—Head .6 mm.; all white, eye and mouth black.

Last Stage.—Head whitish, a dusky shade above the clypeus, eye black mouth, brown; width 1.0 mm. Body all white, waxy, not shining, segments obscurely 3-annulate, a little shaded with blackish in the folds. Thoracic feet rather large, colorless; abdominal ones on joints 6 to 11, distinct, slender. Body uniform, subventral folds somewhat prominent, joint 13 tapering. Length, 6.5 mm. Single brooded; cocoons in decayed wood.

Pontania consors *Marlatt*.

Galls found with the preceding on *S. sericea*, but gregarious, hairy and spherical. Near the base of the leaf, three or two together, rarely but one, exceeding the margin often by half the diameter of the gall; not evenly divided by the leaf, about one-third or a little more above, two-thirds below; pale greenish, often heavily marked and mottled with red above, paler below, rarely uniformly pale. Strongly silky hairy like the leaves below, less hairy or even smooth above; size $8.5 \times 8.5 \times 7$ mm. or as small as 5 mm. in diameter. The substance is fleshy, strongly streaked with pink.

Larva.—Head .9 mm.; all white, eye and mouth black, segments annulate, with large obscure concolorous tubercles; joint 13 tapering.

Single brooded; cocoon in decayed wood.

Pteronus carpini *Marlatt*.

Gregarious on the iron wood,* Fort Lee, N. J., in September. Head shining black, 1.8 mm. wide, under the lens black dotted on a

* I am not certain now whether this tree was the *Ostrya virginica* or *Carpinus caroliniana*.

sordid ground, mouth brownish. Feet on joints 6-11; no glands everted. Segments coarsely 4-annulate with small dark setæ. Color dull green, the spiracles with faintly discolored yellow blotches; dorsal region shaded with black, the color streaked on the annulets, not forming a distinct regular edge and not complete, tending to be broken into dorsal and subdorsal bands. Subventral folds double. A spot below the spiracle and one above the base of the leg, black. Thoracic feet and venter pale. Imago in May. The species is probably double brooded. The larva looks like that of *Pteronus corylus*.

Pteronus integer Say.

Dr. Packard describes a larva on spruce (5th Rept. U. S. Ent. Comm., p. 838) as of this species. It is green with a dusky supra-ocular shade, the dorsal vessel edged with light green and a white lateral stripe. The number of feet is not given.

I think there is some error here and that this larva is not that of *integer*. The true larva is described herewith.

Stage V.—Head sordid greenish with a heavy brown-black shade reaching up each side behind the eye, a dotted shade on vertex, the sutures pale; width 1.6 mm. (♀). Body green like *Nematus chloreus* not very sordid nor very transparent; black marks at the base of the thoracic feet. Segments irregularly 6-annulate in this large larva, bringing the spiracle on third annulet, 5-annulate in another with spiracle placed normally. No other marks. Anal plate concave-truncate as in *N. chloreus*. The larva is throughout closely allied to *chloreus* and differs only in having the head marked with dark shades in the last stage. Tracheal line visible.

Single brooded, no ultimate stage; cocoon as usual in the earth.

Found on *Quercus tinctoria* at Brookhaven, Long Island; not common, the rarest of the oak feeding Nematids

Pteronus quercus Marlatt.

Solitary on white oak (*Q. alba*) resting on the edge of the leaf.

Stage IV.—Head round, eye black, a very faint posterior dark shade; width .9 mm.; whitish, sordid with scarcely any ochreous tint. Body colorless, translucent, appearing sordid from the food by transparency, the incisures folded; segments obscurely 4-annulate, smooth; anal plate concave-truncate, no prongs. A large black spot at the base of the colorless thoracic feet; abdominal ones on joints 6-11. Tracheæ white.

Stage V.—Head 1.3-1.5 mm. (♂ ♀) colorless, faintly yellowish,

eye black; a distinct shaded black line posteriorly from behind the ocellus to vertex. Body sordid greenish, annulets dull, incisures folded. Anal plate and marks at base of thoracic feet as before. Tracheæ and folds of incisures white.

Single brooded; cocoon in the ground.

This larva closely resembles *Nematus chloreus* but is not so green and has a black shade on the head in the last stage. Brookhaven, Long Island, in June.

***Nematus chloreus* Norton.**

On the black oak (*Q. coccinea*) at Bellport, Long Island, in June, a solitary edge-eating Nematid.

Egg slits in the edge of the leaf just before the point of the apex, 1 mm. long, .5 mm. deep, semi-circular, swollen, yellowish.

Stage I.—Head sordid whitish, eye black, a dusky shade behind and over clypeus; width .4 mm. Body whitish translucent, green from the food, smooth, slender, curved, annulate; feet on joints 6–11; a ventral elevation on joint 5; no setæ. Black marks at the base of thoracic feet.

Stage II.—Head whitish, dull, eye black, the vertical shade behind it reaching nearly to apex; width .6 mm. Body rather finely annulate, whitish, green only from the food, bases of thoracic feet marked with black. Anal plate truncate, concave, the posterior rim dusky bordered.

Stage III.—Head rounded, whitish, eye black, a dark shade behind; width .8 mm. Body translucent sordid greenish, no marks except at bases of thoracic feet; spiracles blackish.

Stage IV.—As before, the dusky shade behind the eye has become small; width 1.15 mm. Anal plate projecting, truncate-concave; no prongs. Translucent whitish green with black marks at base of thoracic feet.

Stage V.—Head green, eye black, mouth brown, no marks; width 1.4–1.6 mm. (♂ ♀) clearer green than before, incisures folded; black marks at bases of thoracic feet clouded, small. Anal plate truncate, slightly cordately notched, no prongs. A little green fat in joint 13, the frass not contrasted; dorsal vessel obscure. Head shagreened, dull; body also dull. Thoracic feet colorless, abdominal ones small, slender on joints 6–11 and 13, functional. Segments irregularly wrinkly 6-annulate, last annulet very narrow, the others subequal; no setæ even under a $\frac{1}{2}$ -inch objective. Sometimes the body is faintly yellowish subdorsally from the obscure fat granules; spiracles dusky.

Cocoon elliptical dark brown, single, formed at the surface of the ground. Single brooded. This is the commonest of the oak feeding nematids on Long Island, N. Y.

***Hemichroa fraternalis* Norton.**

♂ described by Norton (Trans. Am. Ent. Soc., IV, 81).

♀ black and rufous. Head black; prothorax pale, whitish, interior lobe of mesothorax and upper half of pleura shaded with brown; abdomen largely pale brown. All the segments above broadly banded with black and narrowly so below. Legs luteous, femora and tibia lined with black. Wings hyaline, nervures black, costa and stigma luteous. Length, 9 mm. Texas, New York, Massachusetts. A perfectly distinct species, not nearly allied to *H. albidovariata*. The larva lives on the young leaves of the white oak in May and early June, solitary. Each larva eats away the leaf from the midrib or a large vein and uses the vein as a perch somewhat in the manner of the young *Liminitis*. They hold on by the thoracic feet and thresh the body around violently when disturbed. There are probably five larval stages.

Stage I.—Head rounded, dull, dusky, eye black; width .4 mm. Body annulate, sordid grayish green, uniform with short black points. A dark line at base of thoracic feet.

Stage II.—Head .6 mm., sordid whitish, gray posteriorly, eye black; body slate gray, whitish below the spiracles.

Stage III.—Head small, leaden black, width .9 mm. Segments 6-annulate, with black points on the second and fourth. Body slate gray, more or less whitish subventrally below the spiracles, a dusky shade along subventral folds. Thoracic feet largely black, abdominal ones small, on joints 6-12, 13: Venter waxy grayish white.

Stage IV.—Head sordid leaden, clypeus and back of head nearly black; antennæ and eye black; width 1.3 mm. Dorsum leaden black, somewhat broadly greenish centrally except in the incisures, below the spiracles nearly white, the subventral folds marked in blackish, forming a double row of dashes. Thoracic feet largely black, abdominal ones pale. Black points on second and fourth annulets small. Later the larva becomes more greenish with growth.

Stage V.—Head black, the face pale and vertex gray; or a light fleshy brown; width 1.6-1.8 mm. (♂ ♀). Body sordid greenish gray, white subventrally, a lateral leaden gray shade band touching the stigmatal line; dusky marks on the subventral folds; points small, black. Thoracic feet pale, black at base; a trace of white bloom on head. In some the subventral region is scarcely contrasted and the larva appears

more uniformly gray. The black points vary in distinctness, sometimes obsolete. Occasionally the larva is very pale, an albino, with dull red head and sordid white body marked with an olivaceous blackish lateral band.

No ultimate stage; cocoon dark brown, formed in the earth. Single brooded.

Larva referred to as "F" Can. Ent. XXVII, 339.

Hemichroa albidovariata Norton.

♀ described by Norton (Trans. Am. Ent. Soc. IV, 81).

♂ closely similar to ♀ with the three basal segments of abdomen above yellowish white, the basal plates black. Two ♀♀, one ♂ from Texas (Belfrage), coll. U. S. Nat. Mus., one ♀ from larva at Bellport, Long Island, N. Y. The larvæ live on the black oak (*Q. coccinea*) in May, eating the young leaves, resting on the edge, the abdomen slightly curled.

Stage V.—Head pale red-brown, eye narrowly black, mouth dark brown; width 1.8 mm. (♀). Feet on joints 6-12, 13, moderate; segments regularly and distinctly 6-annulate, spiracle on second annulet. Color translucent fleshy brown, a lateral row of irregular black spots on annulets 1 (small), 2-3 (large), 4-5 (rather small), the large one broken on some segments; all absent on joint 13; anal plate immaculate. Some small black marks around spiracle; a distinct black patch on the anterior subventral fold and a smaller patch on the posterior one. Feet and venter unspotted, but a black mark at the base of thoracic feet. Dorsal vessel and paired dots on annulet 1 dusky translucent.

No ultimate stage; cocoon in the ground; single brooded.

Hemichroa phytophagica, sp. nov.

♀ extremely similar to *H. albidovariata* but the pale lines on anterior lobe of thorax are short and obscure and the basal plates of abdomen are black.

One ♀ bred from larva from Bronx Park, New York, and two ♀♀ in coll. U. S. Nat. Mus. marked "saw fly on white oak" from Miss Murtfeldt, No. 241 M., Dept. Agriculture, No. 3168.

Found on the young leaves of the white oak in May.

In Bronx Park these larvæ were mixed with those of *H. fraternalis*, and showed somewhat the same habits by eating away the leaf from the midrib; but they do not use this as a perch and are true edge eaters.

Stage I.—Head rounded shining black-brown; width .4 mm.

Body lustreless blackish, segments 6-annulate with rows of short, blunt, pale points on second and fourth annulets, about six on each side.

Tracheal line pale; feet on joints 6-12, 13. Eats the whole leaf on the edge.

Stage II.—Head pale, faintly brownish, eye black with a very faint dark shade reaching upward. Body whitish translucent, colored by the food, the points blunt, fleshy, dark at tip.

Stage III.—Head very pale brownish, eye narrowly black. Body translucent waxy whitish, segments 6-annulate, the points whitish; no marks. Incisures folded, tracheal line white.

Stage IV.—Head pale brown, eye black. Body moderately translucent, dull whitish with a tinge of yellowish and green, the folds of skin whiter. Points obsolete; no marks or, in some, a small black patch laterally on third annulet and another on anterior subventral fold, more or less distinct. In some the points are still visible, pale, rarely distinctly defined by dusky dots. Spiracle on the second annulet.

Stage V.—Head pale, finely brown dotted, eye black. Segments 6-annulate, smooth, no points seen. Skin thin, the body uniformly green from the blood, dorsal vessel dark, outlined by a little green fat, not contrasting strongly. A black patch on the anterior subventral fold and sometimes another laterally. Tracheæ evident, their ramifications visible nearly up to the dorsal vessel. Thoracic feet pale; anal flap smooth. Abdominal feet on joints 6-12, 13. The larva is now very green, differing markedly from the preceding stages. A single example from Bellport, Long Island, had a black dot on the thorax, subdorsally on the second annulet of joints 2 and 3, one on the anterior subventral fold of joint 3 and one at base of each thoracic foot. The paired dusky translucent patches in annulet 1 were also noted. No ultimate stage; cocoon in the ground; single brooded. This larva is possibly a dimorphic form of *H. albido variata*, but the food plants differ and the slight imaginal characters seem correlated.

GENERIC SYNOPSIS OF THE BLENNOCAMPINÆ.

The following tables have been prepared by Mr. Ashmead for his forthcoming revision of the genera of saw flies and he has kindly given me a copy of them for use here.

Family SELANDRIIDÆ.

TABLE OF SUBFAMILIES.

Lanceolate cell petiolate; (in only a single genus, *Kaliosysphinga*, does it appear contracted, but the anal vein is faint or subobsolete before uniting with the submedian vein, while the anal cell in hind wings is wanting).

Subfamily I. *Blennocampinæ*

Lanceolate cell contracted before the middle but still open.

Antennæ 4-jointed, the third joint very long, the fourth very minute.

Subfamily II. *Blasticotominæ*

Antennæ 7 to 15-jointed, the third joint not unusually long, often shorter or not longer than the fourth. Subfamily III. *Selandriinæ*

Lanceolate cell contracted at or at little before the middle and completely closed.

Subfamily IV. *Hoplocampinæ*

Subfamily I. BLENNOCAMPINÆ.

TABLE OF GENERA.

1. Front wings with four submarginal cells. 3
 - Front wings with three submarginal cells, the first transverse cubitus wanting, very rarely with the second transverse cubitus wanting.
 - Hind wings with two discal cells. 2
 - Hind wings without discal cells.
 - Antennæ 11-14 jointed. *Fenella* Westw.
 - Antennæ 9-jointed.
 - Hind wings with a distinct anal cell. *Fenusa* Leach.
 - Hind wings without an anal cell. *Kaliosysphinga* Taschb.
2. Head transverse; clypeus anteriorly truncate; front wing with the second transverse cubitus wanting. *Palmatopus* Hartig.
 - Head large, quadrate, the temples broad; clypeus anteriorly deeply emarginate; antennæ densely hairy, the third joint nearly as long as joints 4-5 united.
 - Xenopates* Cameron.
3. Eyes extending to base of mandibles or at most with only a linear space between. 7
 - Eyes more or less distant from base of mandibles, with a distinct space between.
 - Hind wings not surrounded by a bordering nervure at apex. 4
 - Hind wings surrounded by a bordering nervure at apex, and without a discal cell; claws bifid or with a tooth within.
 - Anal cell in hind wings shorter than the submedian, petiolate or subpetiolate at apex. ♂ * *Periclista* Knowl. (= *Mogerus* Mac G.)
 - Anal cell in hind wings fully as long as the submedian. ♂
 - Isodyctium* Ashm. g. n.
 - (Type *caryicolum* Dyar.)

* Mr. MacGillivray was not justified in changing the name of this genus, since the cynipid genus is *Periclistus*, not *Periclista*.

4. Hind wings without a closed discal cell.....6
 Hind wings with a closed discal cell.
 Claws simple or with a minute scarcely perceptible tooth within.5
 Claws cleft or with a large tooth within.

Anal cell in hind wings as long as the submedian. ♀

Isodyctium *Ashm.*

Anal cell in hind wings shorter than the submedian.

Transverse median nervure in hind wings received by the discal cell at or somewhat *beyond* the middle; sheaths of ovipositor equally thickened and more or less obliquely pointed at apex; third joint of antennæ almost as long as joints 4-5 united. ♀

Periclista *Konow.*

Transverse median nervure in hind wings received by the discal cell *before* the middle; sheaths of ovipositor produced at apex into a thorn like tip. ♀..... **Ardis** *Konow.*

5. Third joint of antennæ longer than the fourth; sheaths of ovipositor at tips obtuse.

Pareophora *Konow.*

Third joint of antennæ a little shorter than the fourth, never longer; sheaths of ovipositor at tips rounded; clypeus anteriorly truncate. **Rhadinocera** *Konow.*

6. Anal cell in hind wings as long as the submedian. ♀. **Isodyctium** *Ashm.*

Anal cell in hind wings shorter than the submedian. ♂ **Ardis** *Konow.*

7. Third joint of antennæ longer than the fourth.8

Third joint of antennæ shorter than the fourth or not longer; hind wings with one discal cell; claws bifid..... **Phylmatocera** *Dahm.*

8. Præsternum of mesosternum not at all separated by a suture.....9

Præsternum of mesosternum separated by a distinct suture.

Clypeus anteriorly truncate; hind wings with one discal cell, the anal cell shorter than the submedian; claws long, simple. . **Tomostethus** *Thoms.*

9. Hind wings with one discal cell.....13

Hind wings without a discal cell.

Hind wings with the marginal cell pointed at apex and sometimes open. .12

Hind wings without a surrounding nervure at apex the marginal cell well rounded at apex and *with* an appendage.10

Hind wings with a surrounding nervure at apex the marginal cell well rounded at apex but *without* an appendage.....11

10. Third transverse cubitus curved inwardly and not extending in the same direction with the transverse radius, the third submarginal cell considerably larger than the first and second united; antennæ densely pilose, tapering toward tips, the third joint longer than the fourth; claws cleft. ♀ ♂. **Parazarca** *Ashm. g. n.*

(Type *fumipennis* *Ashm.*)

Third transverse cubitus straight or nearly so, and running in the same direction with the transverse radius; antennæ pubescent, the third joint nearly as long as joints 4 and 5 united

Claws cleft or bifid; anal vein in front wings straight, not curving upwards at tip; transverse cubitus in hind wings not short, the anal cell shorter than the submedian, briefly petiolated. . ♀ **Erythraspides** *Ashm. g. n.*

(Type *pygmaea* *Say.*)

Claws simple; anal vein in front wings curving upwards at tip; transverse cubitus in hind wings very short, the anal cell longly petiolated. ♀ ♂.

Blennocampa *Hartig.*

11. Third transverse cubitus curved inwardly, not extending in the same direction with the transverse radius, strongly divergent; third submarginal cell larger than the first and second united; pedicel as long as the scape, about thrice as thick. ♂ **Calozarca** *Ashm. g. n.*

(Type *fascipennis* Nort.)

Third transverse cubitus straight or nearly so, and running in the same direction with the transverse radius; third submarginal cell hardly longer than the second, much smaller than the first and second united; pedicel shorter than the scape. ♂ **Erythraspides** *Ashm.*

12. Third transverse cubitus in front wings not running in the same direction with the transverse radius; marginal cell in hind wings with an appendage; third joint of antennæ much shorter than joints 4-5 united; claws with a small tooth within **Scolioneura** *Konow.*

Third transverse cubitus in front wings almost interstitial with the transverse radius, and running in the same direction; marginal cell in hind wings without an appendage, sometimes open at apex; claws with a strong triangular tooth at base. **Entodecta** *Konow.*

13. Hind tarsi usually longer than their tibiæ; clypeus very small, transverse-linear. antennæ densely pilose, the third joint longer than the fourth. ♀ ♂.

Zarca *Cameron.*

Hind tarsi not longer than their tibiæ; clypeus not small, anteriorly subemarginate or truncate.

Antennæ pubescent, the third joint distinctly longer than either the fourth or the fifth.

Third submarginal cell longer than the first and second united; antennæ long, tapering toward tips, the third joint about as long as joints 6-9 united ♀ **Calozarca** *Ashm.*

Third submarginal cell not longer than the first and second united; antennæ with the third joint usually not longer than joints 9-10 united **Monophadnus** *Hartig.*

Antennæ clothed with long appressed hairs, the third and fourth joints equal, the fifth longer, all somewhat thickened toward tips. **Senoclia** *Cameron.*

Periclista diluta *Cresson.*

These larvæ are briefly described from Riley's notes in Packard's Forest Insects (5th Rept. U. S. Ent. Comm., p. 206), but without giving the most essential characters. The bred flies in collection U. S. Nat. Mus., have the lanceolate cell of hind wings unusually long, though still shortly petiolate at tip.

Periclista purpuridorsum, sp. nov.

♂. Black, segments 2 to 4 of tergum dull luteous; angles of prothorax (except a black dot) and tegulæ white; tip of clypeus and labrum pale. Legs black at base, ends of femora and tibiæ whitish and brown, tarsi dusky, nervures brown black; second recurrent received at base of third submarginal cell, almost interstitial.

♀. Reddish brown and black. Head black, tip of clypeus and labrum pale brown. Thorax brown, a black spot on each lobe, lower half of pleura and pectus black; prothorax and tegulae whitish. Abdomen brown, shaded with black on each segment, the basal four segments solidly black; ovipositor sheath black; all the segments above and below narrowly lined with whitish posteriorly. Legs reddish, coxae black, tibiae whitish and tarsi dusky. Middle cells of hind wings one or none. The larva resembles that of *P. diluta* as far as that description goes.

Stage III.—Head black, a pale dot at apex of clypeus; width .6 mm. Body green, food darker, the four dorsal spines on each side black with white limbs.

Stage V.—Head pale in sutures and face, all the black marks touching each other; width, 1 mm. Body green, dorsum faintly shaded with purplish; spines as before, all distinctly furcate.

Stage VI.—Head pale, the lobes broadly black and a geminate spot in clypeus; width, 1.4 mm. Segments indistinctly 5-annulate, two spines on second (spiracular) annulet, one small one on third behind spiracle, three on fourth; two on each subventral fold. Legs on joints 6-12, 13; rest on venter on surface of leaf. Dorsum to spiracles olivaceous blackish, the four dorsal spines black, short with short limbs or reduced to small black buttons; joint 2 anteriorly, subventral region and feet pale greenish white with colorless furcate spines which fringe the sides. The dorsal spines on joints 2, 3, 12 and 13 are not reduced. At the end of the stage the dorsal color fades to purplish.

Stage VII.—(Ultimate.) Smooth, no spines, annulets folded; shining areas represent the tubercles; color translucent waxy greenish white, greener on the thorax, often blue-green; no purple shade. The larvae enter the earth and form cells lined with brown secretion. Solitary on the white oak in May, eating the young leaves; single brooded. Found at Pelham Manor and Bellport, Long Island, N. Y., Washington, D. C.

***Periclista albicollis* Norton.**

Stage IV.—As in next stage; head .7 mm.

Stage V.—Head shining black except mouth and a small arcuate line above clypeus which are greenish; width, 1.1 mm. Spines arranged as in the preceding species, quite large and strongly furcate, all black, even the little one on third annulet and the anterior one of the upper subventral fold; lower subventral spines pale, not furcate. Body translucent green, indistinctly annulate. Feet on joints 6-12, 13.

Stage VI.—Head 1.4 mm. The same, the spines with long tapering limbs, longer than the shaft.

Stage VII.—(Ultimate.) Not smooth, the tubercles represented by small distinct cones; not shining, all very light whitish green, very much whiter than in the feeding stages, slightly wrinkly annulate, no marks, no tarry shades. Larva as high as wide, robust. Spins a rather fine brown cocoon either in the earth or after boring in decayed wood. Single brooded. The larva is solitary, rarely several together, resting on the upper side of the leaves of *Q. tinctoria* early in June. They are unusually sluggish, often feeding upon a single leaf.

Others were found on the white oak (*Q. alba*) which appeared less robust and had a pale space on the spines at the bases of the limbs; but the imagines seem indistinguishable from the others.

Brookhaven, Bellport and Yaphank, Long Island, N. Y.

***Periclista emarginata* MacGillivray.**

♀. Black, clypeus emarginate, labrum pale; abdomen with the tips of segments lined with whitish below, the last segment brownish; prothorax largely and tegulæ white; legs pale, the femora brown, except narrowly on the under side; tips of tarsi dusky. Under wings with one middle cell or none.

Two ♀♀ bred from larvæ similar to those described (Can. Ent., xxvi, 185), which produced the ♂ type.

Stage IV.—As in next stage, spines all pale; head .7 mm.

Stage V.—Head 1.1 mm., a shade above ocelli, the patch in clypeus single, transverse, later double.

Body green, spines all pale, furcate, arranged as in the preceding species of *Periclista*.

Stages VI and VII have been published.

Found on *Q. coccinea* at Pelham Manor and Van Cortlandt Park, N. Y., in May.

***Periclista subtruncata*, sp. nov.**

♀. Similar to the preceding, but the clypeus shallowly emarginate. Shining black, prothorax narrowly and tegulæ white; abdomen entirely black. Legs brown, coxæ and basal two-thirds of femora blackish, tarsi dusky. Sculpturing essentially as in *emarginata*, but the vertical groove on head shows a tendency to cross the transverse one between the posterior ocelli. Length, 5.5 mm. One ♀.

Not strikingly distinct in either imago or larva from *P. emarginata*, but both Mr. MacGillivray and Mr. Ashmead have compared the flies and do not consider them the same.

Stage IV.—Head pale brown, dotted on a greenish ground, a black

patch in clypeus; eye and antennæ black. Body light yellowish green, the furcate spines paler except the thoracic ones which are black tipped. Feet on joints 6-12, 13, the thoracic ones short, scarcely visible from above.

Stage V.—Patch in clypeus brown; body green, dorsal vessel less contrasting.

Stage VI.—Head green, clypeus brownish, eye black. Body rather opaque green, a little whitish dorsally from diffuse fat, dorsal vessel darker green. Furcate spines whitish, dusky tipped on joints 2 and 3 and faintly on anal flap.

Stage VII.—(Ultimate.) Smooth, waxy greenish, eye black; shining, indistinctly annulate, dorsal vessel green. Cocoon in the ground; single brooded.

Found on the black oak (*Q. coccinea*) in Van Cortlandt Park, N. Y., in May.

***Periclista chionanthi* Murtfeldt, (M.S.).**

♀. Shining black; tips of femora and tibiæ dull luteous, tarsi dusky; angles of prothorax narrowly and tegulæ whitish. Wings hyaline, nervures brown-black; second recurrent nervure received at basal third of third submarginal cell. One middle cell in hind wings. Length, 5.5 mm.

Two ♀♀, Coll. U. S. Nat. Mus. (Miss Murtfeldt), no. 296 M.

Larva.—Head shining black, mouth parts only pale. Segments indistinctly 5-annulate, spines furcate, moderate, two on second (spiracular) annulet, three on fourth, two on each subventral fold, all furcate except the pair on lower subventral fold. Body yellowish with numerous fat granules, a broken subdorsal black shade, distinct at the bases of the second spines. Dorsal spines black-ringed at base. Thoracic feet small, abdominal moderate on joints 6-12, 13; rests on venter on surface of leaf. "Slug on white fringe" (*Chionanthus*), Kirkwood, Mo., Dept. Agriculture no. 4048 bis.

***Periclista media* Norton.**

Sitting on the venter on the surface of young leaves of white oak (*Q. alba*), eating circular holes, solitary.

Stage I.—Head very pale brown, eye black; width .3 mm. Body translucent whitish, food brownish; covered with short colorless Y-shaped spines, thick and with short shaft, the limbs blunt, apparently arranged as in the later stages.

Stage II.—Head and body translucent, colorless, eye black; width .4 mm. Spines with long shaft and sharp recurved branches extending

in a longitudinal plane. Segments scarcely annulate. Thoracic feet large, abdominal on joints 6-12, 13.

Stage III.—Waxy white, shining, eye black; width .6 mm. Body pale green, principally from the food. Furcate spines moderate, concolorous whitish. Feet pale. Length, 5.5 mm.

Stage IV.—The same. Head .8 mm., length, 6 mm. The body becomes darker green from the food, but the blood is pale green, tinting the subventral area.

Stage V.—The same; width of head 1.1 mm.

Stage VI.—Entirely green, no marks. Furcate spines rather short; seeming remote, none dark; arrangement as usual in *Periclista* with but two spines on the spiracular annulet. Head greenish white, eye black; width 1.4 mm. Rarely some of the spines are trifid instead of bifid. A variety occurs with a black patch in the clypeus, but it disappears in the last stage, leaving the larva immaculate. Segments indistinctly annulate.

Stage VII.—(Ultimate.) Smooth, all greenish, not shining; head and thorax emerald tinted; dorsal vessel green. Enter the earth and form cells. Single brooded, common on the white oak in May, the commonest of the early spring slugs. Van Cortlandt Park, Bronx Park, Bedford Park, Pelham Manor, N. Y.; Fort Lee, N. J., Brookhaven, Bellport and Yaphank, Long Island.

KEY TO THE AMERICAN SPECIES OF *Periclista*, ♀.

1. Yellow with brown thorax; no black above.....*diluta* Cress.
Prevailing color black.....2
2. Black of dorsum mixed with brown, abdominal segments very narrowly white bordered.....*purpuridorsum* Dyar.
Entirely black above.....3
3. Clypeus somewhat angularly emarginate.....4
Clypeus more broadly and shallowly emarginate or truncate.....5
4. Slender, legs whitish and amber brown; vertical groove from lower ocellar basin distinct.....*emarginatus* Mac G.
Robust, legs shading to black on femora; vertical groove from lower ocellar basin short.....*albicollis* Nort.
5. Clypeus shallowly emarginate.....6
Clypeus truncate, scarcely at all emarginate.....7
6. Legs heavily shaded with blackish brown; transverse groove between upper ocelli straight, slightly crossed by the vertical groove.....*subtruncata* Dyar.
Legs mostly whitish below the femora; transverse groove slightly bent at junction with vertical one, not crossed by it.....*chionanthi* Murtf.
7. Legs pale, femora brownish, abdomen brownish at sides posteriorly; vertical groove short, the lower ocellar basin reaching nearly to the transverse groove.
media Nort.

Isodyctium floridense, sp. nov.

♀. Brown; antennæ, except basal joint, black. Head narrowly darker brown in the sutures, orbits yellowish. Thoracic lobes lined with yellowish as in *rileyi*, but without black, only darker brown double marks on the side lobes. Abdomen brown, basal plates yellowish, lined before and behind narrowly with blackish; beneath shaded with black, especially towards tip. Mesopleura brown, with a yellow line posteriorly. Legs pale. Wings hyaline, veins blackish brown, basal half of stigma pale. Length, 6.5 mm.

One ♀. Florida, U. S. Nat. Mus. (from Am. Ent. Soc.).

Larva unknown.

Isodyctium subgregarium, sp. nov.

♂. Head black, clypeus emarginate with two white dots at tip, labrum pale; clypeus hollowed below each antennæ, the lower rim projecting. Thorax black, tegulæ and collar (except a black dot) white; a line on mesopleura and sutures below white. Abdomen whitish, basal plates and four terminal segments above black, below shaded with black. Legs pale, tarsi shaded with blackish, coxæ and trochanters spotted with black. Wings hyaline, costa pale at base, second recurrent nervure received near base of third submarginal cell. Length, 6 mm.

♀. Pale yellowish, head, thorax and pleura red. Antennæ black except basal joint; narrow black linings in head grooves and in sutures behind mesothorax. Legs yellowish, tarsi slightly tipped with blackish. Wings hyaline, nervures pale, those toward center of wing lined with black. No middle cells in hind wings. Length, 6.5 mm.

Stage IV.—Head green with a large triangular black patch on each lobe and one in clypeus; width .8 mm. Spines furcate, short, three on second and fourth annulets, one behind spiracle, two on each subventral fold, the smaller ones simple. Spines black except the subventral ones; feet pale, abdominal ones on joints 6–12, 13.

Stage V.—The same; patch in clypeus double; width of head 1.2 mm. Spines distinct, the limbs curving, divergent and tapering.

Stage VI.—Head 1.8 mm. Body uniformly green from food, spines black except on lower subventral fold. No change in coloration.

Stage VII.—(Ultimate.) Smooth, entirely green, eye black; shining areas in the places of the spines. Enter the earth and form cells; single brooded.

The larvæ are gregarious in the early stages, but separate before maturity.

Found in May on white oaks (*Q. alba*, *Q. prinus*) at Pelham Manor, Bronx Park and at several places on Long Island.

Isodyctium infrequens, sp. nov.

♀. Robust; head black, a brown dot between antennæ and line at tip of clypeus which is scarcely emarginate. Thorax dark brown, streaked with black on all the

lobes, scutellum black; pleura brown above, black below, pilose. Abdomen brown, segments banded with blackish posteriorly, more distinctly toward base above. Legs brown, tibiæ and tarsi paler. Wings hyaline, costa and stigma pale. One middle cell in hind wings. Length, 6.5 mm.

Stage V.—Head immaculate, eye black; width, 1.1 mm. Body green, dorsal vessel darker; spines moderate, furcate, arranged as is normal for *Isodyctium* with three on spiracular annulet, pale except the terminal ones on joints 2, 3, 12 and 13 which have black limbs and the upper row the whole length which is touched with black at the base of the fork, leaving the apex and shaft pale. Feet pale, 6-12, 13.

Stage VI.—Head 1.6 mm., green, eye narrowly black. Body faintly annulate, spines all pale except the black patches as before. Another had the limbs of the four dorsal spines black whole length.

Stage VII.—(Ultimate.) Head slightly brownish tinted, eye black; width 1.6 mm. Body smooth, green, with shining areas instead of the spines, indistinctly annulate. Color uniform, dorsal vessel dark.

Single brooded, cells in the ground as usual.

Found on the white oak (*Q. alba*) at Brookhaven and Bellport, Long Island, early in June, but probably occurs earlier in the mainland where the season is not retarded by cold winds as on the south shore of the island. Rare.

***Isodyctium murtfeldtiæ*, sp. nov.**

♀. Head black, clypeus emarginate, its tip and labrum whitish. Thorax brown, a black spot on each lobe; metathorax black. Mesopleura brown above, black below, a distinct white line behind; metapleura shining black, lined through the middle with white. Abdomen mostly pale luteous, basal plates and irregular marks on some of the sutures black. Legs pale, black marks only in sutures of trochanters and coxæ. Hind wings with one middle cell. Length, 5.5 mm.

One ♀, Miss Murtfeldt, no. 207 M.

Larva.—Head green, eye narrowly black; width, 1.4 mm. Body green, the spines distinct, well furcate (arrangement not discernible in the specimen, but presumably as in *Isodyctium*), all the basal ones broadly black at the base and with blackish limbs. Food plant, black oak.

***Isodyctium calricolum* Dyar.**

In the larvæ previously described (Journ. N. Y. Ent. Soc., V, 193) only the upper spine on second annulet and upper two on fourth were furcate, the rest being reduced to single spines or cones. I have since found others with the spines nearly normally furcate and others perfectly normal, all the spines furcate except the stigmatal one of third annulet,

the posterior one of anterior subventral fold and pair on posterior fold. On acquiring the last stage (VI) some of the lower spines become single.

Stages IV to VII observed. Rather common on the hickory at Bronx Park and Bedford Park, New York, in May.

The ♂ of *I. bipartitum* Cress. closely resembles this species in coloration, but the head sculpturing and shape of clypeus seem different. The ♀ is unknown, and may turn out to be quite distinct from that of *I. caryicolum*.

KEY TO THE SPECIES OF *Isodyctium*, ♀*.

1. Head in part, at least orbits above pale.....2
Head black.....5
2. Black on head confined narrowly to sutures.....3
Black on head covering most of vertex besides sutures.....4
3. Lobes of thorax yellow lined; orbits narrowly yellowish.....**floridense** Dyar.
Thorax and head uniformly red brown except for slight black marks.
subgregarium Dyar.
4. Lobes of thorax yellow lined, orbits pale above, black before and behind.
rileyi Cress.
5. Upper half of pleura red or brown.....6
Pleura black.....9
6. Slender; ocellar basin narrowed, the vertical groove joining the transverse one between upper ocelli.....7
More robust; ocellar basin, triangular, the vertical and transverse grooves slightly crossing.....8
7. Middle lobe of thorax brown.....**inæquidens** Nort.
Thorax heavily black marked on all lobes.....**murtfeldtiæ** Dyar.
8. Thorax dark brown, the streaks on lobes obscure, brown; abdomen brown at sides.....**infrequens** Dyar.
Thorax brown, obscure streaks black; abdomen yellow at the sides.....9
9. Rather slender, ocellar basin narrow, joining the straight transverse groove above.....**caryicolum** Dyar.

SYNOPSIS OF THE LARVÆ OF THE NORTH AMERICAN

BLENNOCAMPINÆ SO FAR AS KNOWN.

The Blennocampinæ have feet on joints 6-12 and 13, resting flatly on the surface of the leaf; body thick and robust, as high as wide or more so, except in leaf mining forms which are flattened and have degenerate feet.

The group is rather heterogeneous in appearance, but includes all the leaf miners, all the spiny slugs and the smooth slugs that are thick and robust.

* *bipartitum* Cress. not included from lack of ♀ specimen.

The hairy, slimy, long-woolly or slender slugs and all edge feeders are foreign to the group.

1. Resting flatly on surface of leaf, feet moderately developed, functional. 2
 Leaf miners, feet functionless or absent. 16
2. Body with spines or points, distinguishable at least subventrally. 3
 Body smooth. 15
3. Two spines on second (spiracular) annulet. 4
 Three spines on both second and fourth annulets. 9
4. Dorsum shaded with blackish in last stage, at least subdorsally. 5
 Dorsum entirely green. 6
5. Head black spotted; dorsum purplish, on *Quercus alba*.

Periclista purpuridorsum

Similar to the preceding. **Periclista diluta***

Head black; a subdorsal black line, on *Chionanthus*. **Periclista chionanthi**

6. Head and spines black; on *Q. alba*, *Q. tinctoria* **Periclista albicollis**

Head and spines partly or wholly green. 7

7. Head with a black supra-ocellar shade and double spot in clypeus; on *Q. coccinea*.

Periclista emarginata

Head green or with only a brownish spot in clypeus. 8

8. Clypeus brownish; terminal spines dusky on the tips; on *Q. coccinea*.

Periclista subtruncata

All green, at least in last stage; on *Q. alba* **Periclista media**

9. Feeding on trees (*Quercus*, *Carpinus*, *Carya*) 10

Feeding on shrubs or vines (*Rubus*, *Vitis*, *Spiræa*) 13

10. Head largely black spotted, spines black; on *Q. prinus*, *Q. alba*

Isodyctium subgregarium

Head not spotted, spines mostly pale. 11

11. Spines well forked, not degenerate. 12

Spines more or less degenerate in last stage; on hickory (*Carya*)

Isodyctium caryicolum

12. Spines black at base and tip; on *Q. coccinea* **Isodyctium murtfeldtiæ**

Terminal spines only black tipped; on *Q. alba* **Isodyctium infrequens**

13. Spines well forked, dorsal ones with black limbs; on raspberry (*Rubus*)

Monophadnus rubi

Spines reduced to points. 14

14. Head and dorsal points black; on grape (*Vitis*) **Erythraspides pygmæa**

All green, points white; on meadow sweet (*Spiræa*) **Blennocampa spirææ**

15. Head black, body white and yellow; on ash (*Fraxinus*)

Monophadnus barda

16. Mining in oak (*Quercus*) **Fenusa curta**

Mining in raspberry (*Rubus*) **Fenusa rubi**

Mining in alder (*Alnus*) **Kaliosysphinga varipes**

Mining in poplar (*Populus*) **Entodecta populi**

NOTE.—Mr. Ashmead has kindly revised the generic references of

* Insufficiently described.

the insects recorded in the above table in accordance with his generic synopsis.

I have excluded the woolly slugs from this table because *juglandis* is clearly referable to the Selandriinæ. There is probably some error connected with the account of the other woolly slug, *Monophadnus caryæ* of Norton and Packard, and it will be found to be wrongly referred to *Monophadnus*.

NEW SPECIES OF HETEROCERA FROM TROPICAL AMERICA.

BY WILLIAM SCHAUSS.

SYNTOMIDÆ.

Cosmosoma dorsimacula, sp. nov.

Head and palpi black. Legs brown; fore coxæ white. Collar and thorax orange, the latter with two large black subdorsal spots; a minute black point anteriorly on patagiæ. Abdomen orange with four subdorsal black spots; the last three segments entirely black. Wings hyaline, the margins black, the outer margins and apices more widely so; a large black spot at the end of the cell on the primaries. Expanse, 37 mm.

Habitat: Balzapamba, Prov. of Bolivar, Ecuador.

Cosmosoma biseriatum, sp. nov.

Head and palpi black. Collar black with two metallic blue spots. Thorax black anteriorly, orange posteriorly with a large black subdorsal spot containing some metallic blue scales; the patagiæ orange internally streaked with black; thorax below dark yellow, the legs brown streaked at the base with yellow. Abdomen above orange, the last four segments black; the orange portion with lateral transverse black bands, interrupted dorsally. A lateral row of metallic blue spots on all the segments. Underneath the abdomen is yellow; the last segments black and a black band on basal segment. Wings hyaline with black margins, very wide on the outer margins and at apices. A large black spot at the end of the cell on primaries; a large orange spot at the base of the wings. Underneath the wings at the base are yellow. Expanse, 41 mm.

Habitat: Balzapamba, Prov. of Bolivar, Ecuador.

Cosmosoma bolivari, sp. nov.

Head and palpi black. Collar anteriorly black, posteriorly yellow. Thorax yellow, with subdorsal black spots. Abdomen dorsally brown, the first and sixth seg-

ments yellow, the first having a black subdorsal spot; anal scales yellow. Underneath yellow, the last two segments black. Legs light brown, tarsi yellowish. Wings hyaline; the margins finely black; the apices, inner angle and base of primaries more widely black; costal margin of primaries luteous. Expanse, 23 mm.

Habitat: Balzapamba, Prov. of Bolivar, Ecuador.

Chrostosoma cardinale, sp. nov.

Head and palpi black. Collar, thorax and abdomen red; tibiae and tarsi brown. Wings hyaline, veins and margins finely black; apices and inner margin of secondaries more heavily black. A red spot at the base of the primaries and some red scales along the inner margin of secondaries. Underneath with the base of the wings red. Expanse, 28 mm.

Habitat: Colombia.

Tsanthrene pentagona, sp. nov.

Body below, legs, head and palpi bright yellow. Collar yellow with a transverse black streak. Thorax black, patagiae with a central yellow streak. Abdomen above yellow, the last five segments broadly banded with black. Wings hyaline, the veins and fringe reddish brown. Expanse, 24 mm.

Habitat: Peru.

Agunaix lacrumans, sp. nov.

Body black. Primaries smoky black, darkest on the basal half. Secondaries semi-hyaline, black. Expanse, 26 mm.

Habitat: Peru.

The genus *Agunaix* is new and will be described by Sir George Hampson in his work on the Syntomidae.

Paramya flavia, sp. nov.

Palpi and legs light brown. Body otherwise pale yellow. Wings hyaline, veins and margins finely light brown, the apex and outer margins of primaries, also the inner margin of secondaries more broadly so. Discocellular black. Base of the wings light yellow. Expanse, 23 mm.

Habitat: Castro, Parana.

Pheia hæmapera, sp. nov.

Body black; two large crimson spots on collar. Anus crimson. Coxæ and base of abdomen below cream color. Wings hyaline, veins and margins black, most heavily marked at apices and inner angle. A black spot at the end of the cell on primaries. Expanse, 22 mm.

Habitat: Sta. Catherina, Brazil.

Æthria rubipectus, sp. nov.

Palpi black spotted with white. Head black. Thorax black, the collar and patagia finely edged with white. Underneath thorax is crimson. Abdomen metallic

blue, the anal hairs very long and black. Wings hyaline, veins and margins finely black; the apex of primaries broadly black. Expanse, 22 mm.

Habitat: San Domingo, W. I.

Napata unifascia, sp. nov.

Palpi and head black speckled with metallic blue. Thorax black mottled with metallic blue. Abdomen above dark metallic blue, below with a white ventral stripe. Legs black streaked with white. Primaries black, the basal half of inner margin metallic blue; a broad median crimson fascia from the subcostal vein and narrowing towards inner angle. Secondaries dark metallic blue with the extreme margin and fringe black. Underside the same, but on the primaries there is a cluster of metallic blue scales beyond the crimson fascia, and the secondaries have the outer margin and apex more broadly black. Expanse, 27 mm.

Habitat: Chimbo, Ecuador.

Trichodesma obliqua, sp. nov.

Head brown, frons cream color. Thorax and collar brown finely edged with yellowish. Abdomen brown circled with fine yellow lines. Primaries brown; a broad yellow oblique band from the costa, not reaching the inner angle. Secondaries yellow, with the margins broadly black. Underneath the same. Expanse, 30 mm.

Habitat: Rio Janeiro.

SATURNIDÆ.

Automeris naranja, sp. nov.

Primaries olive gray to brown, sometimes shaded with paler in the disk; the antemedial line wavy, indistinct; the postmedial line somewhat curved inwardly from apex, to beyond center of inner margin; this line outwardly dark, inwardly pale. Discal spot large, darker and diffuse, outlined by five black points. Secondaries with the costal and inner margin brownish, with a darker subterminal shade inwardly limited by a black line which also separates it from a deep orange postmedial space which contains the ocellus, the latter being brown with a gray centre and broadly circled with black. Below wings grayish with a dark straight postmedial line and a black discal spot on primaries. Thorax colored like primaries, abdomen blackish above, grayish below. Expanse, ♂, 64 mm.; ♀, 77 mm.

Habitat: Rio Grande do Sul.

Automeris zaruma, sp. nov.

Head and thorax dark velvety brown; abdomen reddish. Primaries yellowish brown, with basal space and postmedial shadings darker, an oblique and irregular bright yellow, antemedial line; the postmedial black, inwardly shaded with yellow, from apex to inner margin at two thirds from base. Secondaries with costal and inner margins reddish; outer margin brownish; a black subterminal band adjoining the larger median space of bright yellow; this yellow space crossed by a black postmedial line; ocellus brown, broadly circled with black and containing a cluster of gray scales crossed by a white line. Underneath the wings are reddish; a large black discal

point with white centre on primaries, a minute white discal point on secondaries. Indistinct dark postmedial lines and subterminal shades. Expanse, ♂, 81 mm.

Habitat : Zaruma, Ecuador.

Automeris castrensis, sp. nov.

Thorax dark brown ; abdomen red ; anal hairs brownish. Primaries narrow with inner angle rounded, also apex rounded, light brown with an oblique indistinct line from apex to middle of inner margin ; this line is inwardly paler, outwardly darker than the ground color ; discal spot round small with paler center. Secondaries bright yellow the outer margin narrowly brown, separated from yellow portion by a black line. Ocellus large, black, with grayish centre crossed by a white line. Underneath wings brown with a large round black discal spot on each wing. Expanse, 55 mm.

Habitat : Castro, Parana.

Dirphia muscosa, sp. nov.

Primaries thickly mottled with greenish and black hairy scales ; an oblique angular line from the costa at one-third from the base to vein 2, where it is joined by the postmedial line which is crenulate. The lines are black, outwardly shaded with grayish ; a dark spot in the cell ; in the ♀ the lines do not meet, but extend to the inner margin some distance apart. Secondaries brownish gray in the ♂, fawn color in the ♀, thickly speckled with dark scales, the outer margin and a subterminal line darker in the ♂ ; in the ♀ only a subterminal line. Thorax same color as primaries ; abdomen orange with transverse black bands in the ♂. Expanse, ♂, 80 mm. ; ♀, 90 mm.

Habitat : Rio Grande do Sul.

NOCTUIDÆ.

Chorizagrotis sorella, sp. nov.

Body grayish brown, the collar slightly reddish. Primaries brown, faintly tinged with reddish beyond the reniform. Space before the spots dark brown, spots themselves of ground color finely outlined in dark brown ; claviform the same ; antemedial line geminate, indistinct, forming three curves ; postmedial very fine, almost punctiform ; subterminal wavy, indistinct with some sagittate spots between veins 3-5. Secondaries semi-hyaline, smoky brown, darkest along the outer margin. Underneath whitish powdered with brown scales ; traces of postmedial line and discal spots distinct on secondaries. Expanse, 39 mm.

Habitat : Las Vigas, Cobre de Perote, Mexico.

According to Prof. J. B. Smith this species is allied to *Chorizagrotis soror* Smith.

Peridroma scorteia, sp. nov.

Body grayish brown. Primaries light brown ; some grayish scales at the base on the inner margin, in the orbicular reniform, along the veins and terminal space. These grayish shades are very indistinct. Antemedial line only visible on costa.

Postmedial fine crenulate. A fine terminal black line, saggitate on veins. Secondaries whitish hyaline, smoky along the outer margin. Expanse, 34 mm.

Habitat: Orizaba, Mexico.

Mamestra gavisa, sp. nov.

Body brown. Primaries dull brown, somewhat shaded with rufous; a black streak at the base; the veins indistinctly grayish; the antemedial pale fawn color finely edged with dark scales; the orbicular and claviform finely outlined with dark scales; the reniform grayish with a distinct white line outwardly, the postmedial fawn color, slightly crenulate and finely edged with dark scales; the terminal space except at apex dark gray with a terminal row of yellowish spots; the fringe mottled gray and fawn color. Secondaries brown, pale at the base. Underneath a postmedial line and discal spot on both wings. Expanse, 32 mm.

Habitat: Las Vigas, Cobre de Perote, Mexico.

Mamestra ciniva, sp. nov.

Head and thorax gray. Abdomen light brown. Primaries silvery gray, thickly speckled with white scales; an interrupted black basal line; the antemedial line black, oblique from the costa to middle of inner margin; the median space a trifle darker; some subterminal black scales; a terminal gray line; fringe white with two gray lines; the orbicular and reniform very indistinct and faintly outlined with black. Secondaries whitish; the veins and outer margin smoky. Expanse, 22 mm.

Habitat: Oaxaca, Mexico.

This species somewhat resembles *M. anguina* Gr., and *M. vecina* Gr., but is much smaller.

Hadena dyschoroides, sp. nov.

Body reddish brown. Primaries light reddish brown, the terminal space except at apex dark brown; the basal line black, geminate, indistinct; the antemedial dark brown, sinuate, a dark median transverse shaded, angled below costa; the postmedial fine wavy, dark brown inwardly shaded with violaceous and outwardly followed by two rows of dark points; the dark terminal space preceded by a wavy violaceous line, a bright yellow spot in the reniform. Secondaries brown, the fringe reddish. Underneath grayish brown; a dark postmedial spot on costa of primaries. Secondaries with a discal spot and postmedial line. Expanse, 21 mm.

Habitat: Orizaba, Mexico.

Hadena orizabena, sp. nov.

Head and thorax violaceous brown; abdomen light brown. Primaries violaceous brown; the central portion of median space darker; some dark scales at the base; the antemedial line paler, irregularly oblique from costa to a paler space on the middle of inner margin; the postmedial similar, slightly sinuate to middle of inner margin also, but not quite touching the antemedial line; orbicular very indistinct, reniform with a large white spot; a subterminal row of white points inwardly preceded by sagittate dark violaceous shadings. Some minute reddish brown spots on costa and

extreme outer margin; fringe dark violaceous brown. Secondaries light brown. Underneath light brown with a postmedial line and discal spot on secondaries. Expanse, 25 mm.

Habitat: Orizaba, Mexico.

Hadena zuelana, sp. nov.

Palpi, head and collar pale fawn in color. Thorax brown. Abdomen gray; dorsal tufts reddish brown. Primaries with the basal half brown, the outer half gray, the basal half sometimes mottled with paler shades; the antemedial and medial lines fine, geminate, very indistinct; the postmedial line fine, dark, very wavy and twice sinuate beyond the cell; the apex darker, with a lunate subapical line outwardly shaded with white; some dark subterminal shadings at the inner angle; the spots indistinct and faintly outlined. Secondaries with the basal half white, the outer half black. Expanse, 34 mm.

Habitat: Aroa, Venezuela.

Out of eight specimens I have of this species no two are absolutely alike and the variation is greater than the description implies.

Eurois bertha, sp. nov.

Head and thorax mottled brown and white. Abdomen light brown. Primaries brown. A pink spot at the base; the basal line white, inwardly shaded with dark brown; the antemedial and postmedial lines fine white, the basal and postmedial spaces slightly speckled with white. On median space the median and submedian veins pink; the spots circled with white; the orbicular dark brown, the reniform in the shape of 8, pink and brown; a dark brown space between the spots and a dark brown spot beyond the reniform. The terminal space mottled with light brown, some subterminal black streaks; a terminal dark line interrupted on the veins. Fringe mottled with gray. Secondaries brown, fringe partly white. Expanse, 30 mm.

Habitat: Castro, Parana.

Eurois orbiculata, sp. nov.

Palpi yellow, laterally brown. Head yellow. Collar and throat mottled yellow and gray. Primaries mottled white and olivaceous brown; the basal line dark olive, the antemedial white, interrupted, and outwardly bordered with a black line; a dark olive space in the cell between the spots. The orbicular small, white; the reniform large, mottled gray and white; the postmedial dark, fine, crenulate, angled beyond the cell, inwardly shaded with white; a subterminal wavy greenish white shade; a terminal black line inwardly shaded with white and interrupted in the veins. Fringe olivaceous with pale streaks opposite the veins. Secondaries light brown. Underneath primaries brownish. Secondaries gray with discal spot, postmedial and subterminal shading. Expanse, 34 mm.

Habitat: Castro, Parana.

Platysenta obscura, sp. nov.

Head, collar and thorax black. Abdomen brown. Primaries black, brown along the inner margin, in the cell and towards apex. A velvety black streak at base

below median vein, some indistinct subterminal brown streaks between the veins. Orbicular brown, outlined in velvety black. Reniform, small, round whitish circled with black and crossed with two black lines; a terminal black line, fringe mottled brown and gray. Secondaries white, the veins black on the outer margin. Expanse, 33 mm.

Habitat: Orizaba, Mexico; Sao Paulo, S. E. Brazil.

Stibadium corazona, sp. nov.

Body gray. Primaries apparently gray, the ground color being olive brown, very thickly irrorated with whitish scales. The antemedial line fine, pale, nearly straight; the postmedial pale, angled beyond the cell and then straight to inner margin, above which it is inwardly shaded with olivaceous; a pale subterminal shade straight from apex to angle of postmedial, then wavy to inner angle. Secondaries grayish brown, with an indistinct subterminal pale line. Expanse, 35 mm.

Habitat: Orizaba, Guadalajara, Mexico.

Stibadium jalada, sp. nov.

Head and thorax rufous. Abdomen brown. Primaries olivaceous brown, thickly speckled with lilacine scales, the outer margin paler; the lines fine olive brown, devoid of lilacine scales; the antemedial angular, the postmedial forming a large curve beyond the cell; the medial line geminate, indistinct. Secondaries grayish brown, with a fine postmedial line. Expanse, 33 mm.

Habitat: Guadalajara, Mexico.

Plagiomimicus musculus, sp. nov.

Head and thorax light gray, abdomen light brown. Primaries mouse gray; an indistinct antemedial whitish line angled at the cell; a broad white band indistinctly divided by a grayish line from the costal margin close to the apex to just beyond the middle of inner margin. Secondaries grayish white. Primaries below grayish. Secondaries below white, speckled with gray on the costal margin. Expanse, 24 mm.

Habitat: Oaxaca, Mexico.

Grotella dulcita, sp. nov.

Body and primaries bright silky yellow. Secondaries dark gray, the fringe yellow. Underneath primaries dark gray with the costal margin and fringe yellow. Secondaries below light gray. Expanse, 23 mm.

Habitat: Guadalajara, Mexico.

Eustrotia malonia, sp. nov.

Palpi black. Head and collar white. Thorax and abdomen brownish yellow speckled with white. Wings pale creamy brown. Primaries with a black spot at the base of the costa; an antemedial white wavy band, spotted with yellow, and starting from a conspicuous black spot on the costa; the postmedial line fine, white, shaded with brown and also starting from a black costal spot, then curved beyond the cell, and wavy to the inner margin; a heavy white subterminal shade; an interrupted terminal black line; fringe grayish brown, spotted with white. Secondaries pale

brown, shaded with white at the base and along the inner margin ; a terminal dark line ; fringe mottled brown and white. Expanse, 22 mm.

Habitat : Sao Paulo, S. E. Brazil.

GEOMETRIDÆ.

Pityeja picta, sp. nov.

Head and thorax cream color, the latter speckled with reddish brown ; abdomen cream color. Primaries with the base cream color defined by a reddish oblique line ; the antemedial line very oblique to the centre of the inner margin, reddish brown ; the space before it light brown mottled towards the base with white ; the postmedial line nearly straight from costa to vein 4, and then forming an inward curve to near the inner angle ; the median space white crossed by reddish brown veins and some transverse striæ especially in the cell ; beyond the postmedial line the wing is dark gray shading to reddish brown on the outer margin, mottled with darker striæ ; near the apex some reddish spots. In the ♀ the dark basal and postmedial spaces are thickly spotted with white. Secondaries white, the inner and outer margins, especially about the anal angles, light reddish brown with some grayish striæ. A terminal blackish line, and a black spot on the prolongation between veins 3 and 4. Expanse, 29 mm.

Habitat : Jalapa, Mexico.

Ophthalmophora fasciata, sp. nov.

Body brown. Primaries dark brown, crossed by a broad median yellow band, very wide on the costal margin, narrowing at the median vein and then widening slightly to the inner margin ; some yellow spots on the extreme margin and fringe yellow, except from veins 2-4, where it is brown. Underneath the same but no spots on the margin except at anal angle. Secondaries above dark brown ; the apex, outer margin and fringe yellow ; a subterminal silvery line and four postmedial ocelli black, circled with yellow and containing some silvery scales. Underneath the same but without the ocelli or silvery line. Expanse, 23 mm.

Habitat : Castro, Parana.

This species is closely allied to *O. asopis* Druce.

Aplogompha chotaria, sp. nov.

Body yellow ; two longitudinal brown streaks on thorax. Abdomen with brown spots and transverse lines. Primaries yellow with transverse rows of small quadrate brownish spots ; basal, subbasal, antemedial and medial complete ; the postmedial and subterminal rows coalescing between veins 4, 5 and 6, and represented by a single spot on the inner margin ; a terminal row of smaller spots. The spots along the costa, the terminal and some of the subterminal spots shaded with metallic scales. Secondaries yellow with similar rows of spots, the terminal and subterminal rows also shaded with metallic scales. Expanse, 16 mm.

Habitat : Jalapa, Mexico ; Aroa, Venezuela.

Bapta ruptilinea, sp. nov.

Primaries silky white, thickly irrorated with creamy scales and sparsely speckled with dark brown. An indistinct antemedial shade not reaching the costa ; the post-

medial shade broad, interrupted between the veins giving it a denticulate appearance ; a terminal row of black points. A black point in the cell. Secondaries similar but with only the postmedial shade, which does not reach the costal margin and is most distinct on the inner margin. Expanse, 26 mm.

Habitat : Castro, Parana.

Allied to *B. hebetior* Warr, from the same locality.

Lozogamma (?) setaria, sp. nov.

Wings pale silky grayish brown. An almost imperceptible wavy brown antemedial line ; a minute discal point ; a postmedial straight brown line edged on either side with dark brown. Secondaries with a trace of a postmedial line on the inner margin. Expanse, 23 mm.

Habitat : Castro, Parana.

Semiothisa oaxacana, sp. nov.

Wings entire, very pale reddish brown, darker beyond the postmedial line, thinly speckled with dark brown scales ; the veins and a postmedial line buff, the latter straight on the primaries, slightly wavy on the secondaries ; traces of a fine medial line on the primaries. A minute black spot in the cells, terminal black points between the veins, underneath the same. Expanse, 26 mm.

Habitat : Oaxaca, Mexico.

Microgonia gilva, sp. nov.

Pale yellow, tinged with green, the basal and medial space on primaries somewhat grayish, iridescent. An irregular antemedial black line edged with whitish scales ; a minute black discal point ; the outer line fine, black, outwardly bordered with white, angled near apex and then slightly wavy to middle of inner margin ; this line is continued on secondaries where it is still more wavy ; the outer margin with lilacine stræ and three subterminal cuneiform marks ; a wavy lilacine subterminal shade on secondaries. Underneath primaries bright yellow, except inner margin which with secondaries is grayish ; the outer line brownish, broadly shaded outwardly with white on the primaries ; on the secondaries it is perpendicular from costal margin to below cell where it forms a large curve to centre of inner margin. Expanse, 56 mm.

Habitat : Castro, Parana.

Allied to *M. mexicata* Gn., but readily distinguished by color, wavy line on secondaries and absence of glaucous spot on inner margin of primaries.

Microgonia fulcata, sp. nov.

♂ olive green, ♀ dark brown. Primaries very acute as in *platyptera* Gn. ; a fine basal line ; an antemedial line oblique from costa to median vein, then slightly wavy, perpendicular to inner margin ; a minute discal point followed by an oblique dark shade from costa ; outer line curved from costa to nearly outer margin, then angled and inwardly oblique to inner margin at two-thirds from base ; this line is heavily marked and dark brown followed by a narrow pale shade and is continued on the secondaries to middle of inner margin ; there is also an angular subterminal shade

on secondaries. Underneath the wings are grayish in the ♂ with brownish mottlings; the outer margin on primaries and apex being dark brown. In the ♀ underneath wings are dark brown suffused with lilacine; the primaries with a white mark before the apex, and some postmedial white spots on secondaries. Expanse, ♂, 57 mm.; ♀, 67 mm.

Habitat: Castro, Parana.

This species is very distinct.

***Azelina castraria*, sp. nov.**

Antennæ simple. Wings hardly dentate. Body and primaries dark greenish gray shaded with buff in the cell. The inner line wavy, oblique from the costa at a third from the base to the inner margin beyond the middle and nearly contiguous to the outer line which is nearly straight and runs parallel with the outer margin. Both lines finely velvety brown, shaded with olive green which nearly fills the base of the V formed by the two lines. A minute black discal point. The outer line is outwardly shaded with lilacine, then with a dark greenish shade and finally with pale buff. All these colors running into each other. Secondaries buff, speckled with dull greenish gray. The inner margin and anal angle reddish brown. A submarginal dark shade, divided by a faint buff line. Underneath grayish, the costal half of each wing reddish brown, mottled with gray. An indistinct white outer line and a black discal spot on the secondaries. Expanse, 33 mm.

Habitat: Castro, Parana.

Nearest *Azelina scitaria* Obt.

Subfamily ASCOTINÆ.

***Psilopora thesea*, sp. nov.**

Wings gray, thinly speckled with dark brown, the lines dark brown: the ante-medial fine, perpendicular to subcostal, then a curve to near submedian and then inwardly oblique to inner margin. A dark discal point; beyond this a curved median line and a wavy punctiform postmedial line; the space between these two lines filled in with dark brown from inner margin to vein 4; a fine reddish shade beyond post-medial and a darker subterminal grayish line; a terminal row of black points. Secondaries with a broad dark median fascia from inner margin, slightly bifurcating at cell and not reaching costal margin; a postmedial punctiform line, followed by two fine reddish shades; the margin darker gray. Expanse, 26 mm.

Habitat: Castro, Parana.

***Physocleora tascaria*, sp. nov.**

Wings white, finely powdered with light brown, lines fine, indistinct and interrupted, marked by larger spots on the costa; the postmedial punctiform, the largest spot being between veins 3 and 4 and is followed by a bright yellow spot, a terminal row of dark points. Secondaries with the lines more distinct, the basal fine, wavy; the median distinct, just beyond the cell spot, and geminate; a postmedial and sub-terminal grayish shade; terminal spots between the veins. Underneath primaries

dark gray, secondaries sordid white, discal spots and terminal wavy dark line. Expanse, 21 mm.

Habitat: Castro, Parana.

Physocleora obscura, sp. nov.

Wings gray in the ♂, light brown in the ♀; the basal space and costa grayish, the former limited by a dark line, nearly straight. A perpendicular fine median line; the postmedial wavy, geminate, the space within filled in with reddish brown; the margin mottled brown and gray with an irregular angular white subterminal line, enclosing some cuneiform black marks. Secondaries heavily powdered with gray; the antemedial line heavy, dark gray, the postmedial fine, indistinct, followed by reddish brown shadings. A terminal dark line on both wings, thickened between the veins. Underneath gray, primaries with a basal, median, postmedial and subterminal dark lines, the latter outwardly shaded with white. Secondaries with a broad antemedial band and a fine postmedial line. Expanse, ♀, 21 mm.

Habitat: Castro, Parana.

Physocleora punctilla, sp. nov.

Wings white with a few black speckles; lines black; the antemedial forming a large curve, the space within being shaded with light brown; a black median spot on costa and a small discal spot below it; the postmedial line fine wavy, followed by a distinct reddish brown shade; the marginal space heavily shaded with dark gray, divided by a subterminal white angular line; a terminal row of black points. Secondaries the same, but with the discal spot larger and more distinct. Underneath gray, the margins broadly darker. A postmedial punctiform line and discal spots. Expanse, 15 mm.

Habitat: Castro, Parana.

Stenalcidia nortonia, sp. nov.

Pale gray, speckled with brown scales. A fine antemedial line, punctiform on subcostal and median veins; an oblique median yellowish line not extending above cell; a postmedial punctiform line nearly straight from near apex to middle of inner margin, followed by a broad smoky shade; margin darker with a terminal row of dark points. Secondaries with a broad antemedial dark band; the postmedial line fine, followed by two reddish gray lines; a terminal row of black points. Underneath darker gray; on the primaries a straight postmedial line, and on the secondaries an antemedial band and postmedial line; the lines somewhat punctiform. Expanse, 26 mm.

Habitat: Castro, Parana.

Described from a well-marked ♂. The secondaries are slightly excavated below apex with a slight tooth at vein 4 and then the margin is straight to anal angle.

Stenalcidia cindica, sp. nov.

Wings whitish thinly powdered with gray; lines dark brown; the antemedial slightly curved and inwardly oblique to inner margin, marked by a large dark spot on costal, a smaller one on median vein and inner margin, preceded by an oblique

light reddish brown shade; the median line less distinct, wavy, and slightly curved, marked by a dark spot on costa; the discal point forms part of the line; the post-medial line thickened in places, slightly curved to below vein 2 where it touches the median line and then perpendicular to inner margin; this line is followed by a light reddish brown shade; a subterminal lunular white line heavily shaded with dark gray on either side, especially between veins 4 and 6; beyond this the veins are shaded with light reddish brown; a terminal row of black triangular spots between the veins; fringe pale, spotted with gray. Secondaries with an antemedial line straight; discal spot distinct; postmedial finely acute, followed by a broad reddish brown shade; sub-terminal line dark gray, angular; beyond this a row of triangular grayish spots filled in with reddish brown; a terminal black line, thickened between the veins. Underneath sordid white with antemedial and postmedial punctiform lines, the fringe also distinctly spotted. Expanse, 28 mm.

Habitat: Castro, Parana.

The female is larger, more thickly irrorated with gray, and the lines very fine and punctiform.

***Tephрина submarcata* sp. nov.**

Wings above sordid white, irrorated with brown scales; the lines hardly perceptible, but strongly marked by four brown blotches on costa of primaries; a brown discal spot; fringe brown, at inner angle buff; a terminal row of dark spots between the veins. Secondaries more heavily irrorated with brown along the outer margin; a faint postmedial line and subterminal shade; an interrupted terminal brown line; fringe buff. Underneath yellowish with strong brown mottling and striae. The post-medial line straight and broad on primaries, punctiform on secondaries. Expanse, 26 mm.

Habitat: Guadalajara, Mexico.

***Tephрина griseata*, sp. nov.**

Body and wings dull gray; fine antemedial, medial and postmedial lines, the latter closely followed by a dark subterminal shade not extending above vein 6; the lines marked by a dark spot on costa. The extreme costa mottled with buff. A small discal spot with pale centre. Fringe buff interrupted by darker scales. Secondaries with antemedial, postmedial and subterminal lines very indistinct. Underneath pale gray thickly clouded with darker gray. Expanse, 25 mm.

Habitat: Jalapa and Oaxaca, Mexico.

***Tephрина guarana*, sp. nov.**

Wings dove color, the veins yellowish; costa yellowish with some black striae; a curved antemedial yellowish line, inwardly shaded with black; a straight post-medial yellowish line, outwardly shaded with black, at four fifths and parallel to the outer margin. Secondaries with a straight postmedial yellowish line not reaching the costal margin. A blackish discal spot in cells of both wings. Underneath buff, powdered with gray. Expanse, 31 mm.

Habitat: Oaxaca and Guadalajara, Mexico.

This species comes nearest to *T. irrorata* Pack.

DESCRIPTION OF LARVÆ OF HEMILEUCIDS FROM
THE ARGENTINE REPUBLIC.

By HARRISON G. DYER.

Hyperchiria coresus *Boisduval*.

Larva shaped as *H. io*, large, cylindrical, with prominent head. The body bears bunches of long stinging spines as in *H. io*, three rows on joints 2 to 13 on each side, a single dorsal one instead of the first row on joints 12 and 13, anal plate bare; a fourth row on joints 2 to 6, 11 and 13. The shaft of the tuft of rows 1 and 2 is very long (10 mm.) except the mid-dorsal of joint 13, which is rudimentary; row 3 is small, especially on the abdomen, not over 2 mm. in length and row 4 is still smaller. A few fine secondary hairs, short and pale. Color green, a narrow, broken black, substigmatal line on joints 5 to 13, edged below by a white band; a black patch, dotted with white on the anterior side of the segment subventrally on joints 6 to 12; anal plate blackish, pale dotted. An eversible gland behind the spiracle on joints 5 and 11. Width of head, 6 mm.; length of larva, 80 to 100 mm.

Hyperchiria viridescens *Walker*.

Three rows of tufts of spines on joints 2 to 13, single dorsal on 12 and 13; a fourth row on joints 2 to 6, 11 to 13. Spine shafts short, subequal, the spines coarse, the upper row bearing piercing caps, the two lower rows setæ only. Rather numerous, pale, secondary hairs most abundant and longest on the feet. Color black, the head, leg plates and anal plate shining, the body sooty. Spines pale yellowish, contrasting. Width of head, 6 mm. The eversible stigmatal glands cannot be made out in the specimens. This differs unexpectedly from the other species in the presence of a fourth spine tuft on joint 12 (tubercle vii not aborted).

Eudyarja venata *Butler*.

Head large, smooth, not bilobed, rounded, shining brown, the mouth and a spot covering the ocelli black; width, 7.5 mm. Body with tufts of stinging spines arranged exactly as in *H. viridescens* described above, the fourth row present on joint 12. Body black, the feet and anal plate shining; the segmental incisures from joints 3 to 12 are occupied dorsally as far as the third spine tuft by broad reddish brown, transverse bands, contrasting with the body. Spines ochreous brown like the head. A few blackish, rather stiff, secondary hairs.

Hylesia nigricans *Berg*.

Head rounded, smooth, shining black, curiously marked with white streaks; a line on the vertex in the median suture, an inverted V mark over the clypeus, a dash above each eye, joined by a spur above to a quadrate patch on the posterior side of the head; width, 3.5 mm. Body with rows of spine tufts as in *H. viridescens*, the fourth row present on joint 12; row 1 on joints 5 to 12 is somewhat shorter than rows 2 and 3 but not so markedly as in *Hemileuca* and *Pseudohazis*, from which this larva also differs in the presence of the fourth spine on joint 12. Rather numerous, pale, secondary hairs are present. Body black, a broad white stigmatal band, white dots at the bases of the secondary hairs and pale streaks in the segmentary incisures. Spine shafts brown-black, the spines brownish.

I am indebted to Mr. G. Ruscheweyh for sending me these larvæ.

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THE LIFE HISTORIES OF THE NEW YORK SLUG-CATERPILLARS.—XVI, WITH CERTAIN ADDITIONS AND CORRECTIONS.

PLATE VIII.

BY HARRISON G. DYAR, A.M., PH.D.

Tortricidia testacea Packard.

- 1864—*Tortricidia testacea* PACKARD, Proc. Ent. Soc. Phil. III, 337.
1882— “ “ GROTE, Check List, Bombyces, no. 195.
1891— “ “ SMITH, List. Lep. no. 1211.
1892— “ “ KIRBY, Cat. Lep. Het. I, 551.
1894— “ “ NEUMOEGER & DYAR, JOURN. N. Y. ENT. SOC. II,

SPECIAL STRUCTURAL CHARACTERS.

Dorsal space moderately broad, narrowing only a little toward the extremities, arched; lateral space broad, oblique, concave; subventral space small, retracted. Ridges slightly prominent, never tubercular, furnished with single or furcate swollen-tipped setæ in stage I, afterward with rudimentary setæ which nearly disappear at maturity. Outline from dorsal aspect elliptical, notched at the anterior part of joint 13 to form a short quadrate tail. Skin covered with close, appressed, rather large, clear granules, which appear immediately after first molt, a little papillose on the margins, becoming smoother and increasing in number at subsequent molts. Depressed spaces large, well developed, deep, with sharp sides, the bottom flat and finely granulated. The spaces (1) to (8) are present, dividing the surface into a series of raised latticed ridges.

The larva is throughout very smooth. The coloration is green with a large red mark appearing in the middle of the back, finally reaching head and tail and the middle of the sides.

This species is more generalized than its ally, *T. pallida*. It is the stem form, from which *pallida* is just beginning to diverge. It is the more northern form of the two and in this again shows its ancestral condition, since, belonging to the Palæarctic Eucleids, it is less distantly removed from the ancient habitat of the group.

AFFINITIES, HABITS, ETC.

This larva is closely allied to *T. pallida*. It has all the same structure and coloration, differing only in certain details which might be considered to be of but varietal rank, except that they prove to be constant. The certain differentiation of these larvæ is difficult except when the whole life history is seen, and then a number of differences appear. The real difference between the species is found in the date of occurrence. The moths of *testacea* emerge unusually early, nearly a month before the allied species. My dates are June 10th to 14th for moths bred at Long Island. Professor G. H. Hudson finds June 9th to 22d for all the moths he has taken at light at Plattsburgh during a series of years. Consequently, full grown larvæ are found early, often during July at the time when *T. pallida* is hatching. This is not a case of two differently colored broods, as I thought at one time. Both species are strictly single brooded, like all the other northern Eucleids. The power of early emergence gives *T. testacea* a northern range, since it pupates in time to avoid early frosts. In the Adirondacks it was the only Eucleid met with.

The larva is a rather low feeder, occurring in the same situations as its ally, *T. pallida*. The habits are the same. There are seven larval stages, occasionally six by the omission of stage II and still more rarely eight by the interpolation of an extra stage before the last, as Mr. L. H. Joutel tells me happened to a larva that I sent him to breed.

CRITICISM OF PREVIOUS DESCRIPTIONS.

I have no references to this larva as such. Probably the descriptions referred to *T. pallida* cover *testacea* in part, but I find it difficult to sort them out without dates of occurrence. The diagnosis given by Miss Morton and myself (JOURNAL N. Y. ENT. SOC., III, 146) of (?) *T. testacea* refers more probably to *Kronæa minuta* Reakirt. Miss Morton thought she had bred the larva, getting an imago *testacea*, but there must have been some error. I followed her opinion at the time of writing the synopsis as I had not then bred *testacea* myself. A corrected table will be given at the end of these articles. My account of *T. pal-*

lida (JOURNAL N. Y. ENT. SOC., IV, 167-172) contains many sentences referring to *T. testacea*. Having wrongly identified the larva of *testacea* and being under a misapprehension as to the close relation of several of our smooth red-spotted Eucleids and further desirous of including all the varieties of *pallida* while I was writing about it, I went too far and included portions taken from larvæ of other species. The account, therefore, is based on *Tortricidia pallida*, *T. testacea* and *T. (Heterogenea*) flexuosa*, confused together. It is fully corrected herewith, with illustrations of both species.

DESCRIPTION OF THE SEVERAL STAGES IN DETAIL.

Egg. Elliptical, flat, whitish translucent on white leaves, shining; reticulations faint, narrowly linear, elongate. Size $1.0 \times .6$ mm. Laid singly on the under side of the leaf.

Stage I. (Plate VIII, fig. 1). Elliptical, rather elongate, dorsal and lateral spaces rather broad. Setæ as in *T. pallida*, the Y-shaped ones large, strongly alternating, those on joints 5, 7, 9 and 11 leaving out. Color translucent whitish with a slight green tint. Skin smooth. Length .7-1.1 mm. The larva feeds during this stage.

Stage II. Distinct short black setæ, two on subdorsal ridge, one on lateral ridge on the abdominal segments. Subdorsal ridge rather square, dorsum flat, rounded; tail quadrate; sides concave. Lateral ridge moderate, subventral space small, retracted. Depressed spaces all present as in the mature larva, deep, sharp, the latticed ridges composed of one row of large clear granules, becoming subpapillose on the lateral ridge. Color pale greenish without marks. Length, 1.1-1.7 mm., or reaching 2.2 mm. in six-stage larvæ.

Stage III. Elliptical, tail rounded quadrate; all pale green. Skin structures the same as before; setæ quite distinct. Length, 1.6-2.2 mm. Six-stage larvæ, which have omitted stage II, have the size and coloration of the next stage.

Stage IV. (Plate VIII, figs. 2, 3). Elliptical, both ends rounded, the anterior more obtusely; dorsum arched. Ridges low, the subdorsal shorter than the lateral. Body smooth, setæ nearly obsolete. Skin coarsely clear-granular except in the large depressed spaces which are finely granular and on the lateral ridge where the granules become subpapillose. Color light yellowish green; during the stage the subdorsal

* I find that none of the American species belong to *Heterogenea* Knoch except *shurtleffii* Pack. which is distinct from *casonia* Grt. A generic revision will follow.

ridge becomes pale, a large rounded quadrate reddish spot appears dorsally, covering joints 7 to 9 and reaches the subdorsal ridge; as the stage advances this becomes better defined, regularly elliptical, covering joints 6 to 10 and reaching nearly half way down the lateral space. It is bordered with yellow, this color extending also backward and forward for some distance along the subdorsal ridge (Plate VIII, fig. 3). Length, 2.2 to 3.3 mm.

Stage V. (Plate VIII, fig. 4). Shape as before. Skin surface the same, but the granules on the latticed ridges are more numerous. Setæ obsolete, scarcely discernible except at the ends of the body. Color green, dorsal patch elliptical, but now a little angled at the sides, a slight point projected to the depressed space (4) of joints 6-7 and 9-10 and a more decided one reaching below the space (4) on joint 8. The patch is rounded before and behind and contains a varying paler central space, which may be so large as to reduce the patch to a red line but is usually small and quadrate. Yellow border distinct, reaching as a subdorsal line nearly to head and tail. Depressed spaces greenish. Length, 3.5 to 4.7 mm.

Stage VI (Plate VIII, fig. 5). Structure as in the mature larva and as before. Color green, the depressed spaces concolorous. A large red patch of varying shade covers the center of the back, more rounded out and larger than before and enclosing six of depressed spaces (1). Its outline is elliptical, a little irregular or notched on the sides, the furthest lateral extension being on joint 8 where it reaches depressed space (5). The patch does not reach either extremity, though a small detached red spot may occur on joint 3. There is a more or less distinct central, square, pale blotch on joints 7, 8, sometimes large as before. A single example found on hickory had the patch blackish chocolate, narrowly bordered with red and yellow. Length, 4.7 to 6.7 mm.

Stage VII.—(JOURN. N. Y. ENT. SOC., IV, pl. VI, figs. 5, 6, 7) shape as described. Depressed spaces as in *T. pallida* (l. c. pl. VI, f. 8). Latticed ridges coarsely clear granular, the depressed spaces finely granular. Color green, depressed spaces pale with dark centers. Dorsal mark reaching the extremities and lateral margins in the form of a cross with four projections from the center which touch the depressed spaces (4) of joints 6-7 and 9-10 (l. c. pl. VI, f. 6), or filled out to a larger diamond-shaped mark, produced narrowly forward to joint 3 (l. c. pl. VI, f. 7). It has a pale salmon-colored center, often square and covering only one depressed space (joints 7-8) or rarely larger, occasionally wanting. The patch is bordered with crimson and yellow

and is usually darker around the edge and on the latticed ridges. The exact shape is variable, but the points mentioned form its boundaries between which the outline may be contracted or expanded. Length, 6.7 to 9.5 mm.

Cocoon with the characters of the group.

Food-plants: Oak, wild cherry, birch, hickory, chestnut, witch-hazel and sour gum have been observed.

ADDITIONS AND CORRECTIONS.

As it was necessary to make the corrections to the account of *T. pallida* with this plate, I have included all additions and corrections that have occurred to me to date, to all the articles that I have published on Eucleid larvæ in this JOURNAL. Corrections to the introductory article will be deferred to the concluding remarks.

Apoda y-inversa Packard.

This JOURNAL, III, p. 151. Omit the reference to the larva. *A. y-inversa* larva was undescribed previous to our article.

This JOURNAL, III, p. 152, lines 8, 9. Omit the words "in which the larva does not feed." P. 154, *Stage I*.—Add "The larvæ feed in this stage. Length, .9 to 1.5 mm. Subdorsal setæ of joints 5, 7, 9 and 11 lean outward, lateral of joint 5 leans upward."

This JOURNAL, III, Plate VI, Fig. 1. The alternation of the setæ is wrongly represented.

Sibine stimulea Clemens.

Comparison may be made with the allied South American species referred to by me (Can. Ent., XXIX, 77).

Tortricidia pallida Herrich-Schäffer.

This JOURNAL, IV, 167, et seq. *Special structural characters*, line 5 of paragraph, omit the words "smooth or;" p. 168 line 10 for "setæ practically" read "tubercles."

Affinities, Habits, etc. Read as follows: This larva is typical of the red-marked smooth Eucleids, a subdivision of the Palæarctic group. It is most nearly allied to *T. testacea*, less closely to *H. flexuosa*. It represents a more primitive state than *Apoda* in that setæ *ia* and *ib* on joint 4 and *i* and *ii* on joints 5 to 12 are partly united into a furcate or Y-shaped spine, both limbs of equal length, whereas in *Apoda* one limb has been reduced to a slight prominence.

The moths emerge rather late in the season. Professor G. H. Hudson has taken them at light between June 26th and July 29th at Plattsburgh during several years. My own dates for bred moths are July 8th to 19th.

Full grown larvæ are not found till September. In Long Island, eggs and young larvæ were found on the trees at the time the larvæ of *T. testacea* were maturing.

This larva is a little more specialized than *T. testacea*, in that the dorsal patch becomes earlier defined and grows larger while the granules are a little more papillose. The two larvæ, however, are not distinguishable in any strong character.

The larva is rather a low feeder, occurring on higher bushes and the lower branches of trees, along the edges of woods, etc., not as a rule in very shaded locations. Rarely more than one larva is found on the same plant. They are well scattered, not affecting any particular tree and occurring almost everywhere, not abundant locally and elsewhere rare as *H. flexuosa* is. The larva remains on the back of the leaf where its shape and color are adapted to its concealment.

Criticism of Previous Descriptions. The "*T. testacea*" that Dr. Packard described from a larva I sent him, may be correctly named. The date of occurrence would decide.

Description of the Several Stages in Detail. *Stage I.*—Add: Setæ large, strongly alternating, those on joints 5, 7, 9 and 11 leaning outward.

Stage II.—Read: Elliptical, narrowed behind, tail quadrate. Subdorsal ridge rather square, dorsum flat, rounded; sides concave. Lateral ridge moderate; subventral space small, retracted. Setæ short, distinct, pointed, black, two on subdorsal ridge, one on lateral ridge on abdomen. Depressed spaces large, sharply edged, deep, as in the mature larva. Latticed ridges apparently one granule wide, but not smooth and clear, being all finely papillose, especially on the lateral ridge, though also showing on the subdorsal ridge, feathery and frosted. Color frosted whitish, no marks. Length, 1 to 1.6 mm.

Stage III.—Read: Elliptical, tail rounded quadrate, structure as before. Setæ still distinct, short, black. Skin neatly granular as in *T. testacea*, papillose only around the margin. Colorless, greenish, a faint red shade centrally on the subdorsal ridges. Later this develops into a large red patch, becoming rounded, the depressed spaces covered by it pale. Length, 1.6 to 2.5 mm.

Stage IV.—(Plate VIII, fig. 8). Elliptical, both ends rounded, the

anterior more obtusely; dorsum arched, the highest point a little before the middle; tail quadrate. Ridges low, not prominent, the subventral shorter than the lateral. Body smooth, setæ still visible. Depressed spaces large, the latticed ridges beginning to be more than one granule wide, those of the subventral ridge subpapillose or slightly cleft. Color whitish, green only in front; dorsal red patch large, covering joints 6 to 10, pentagonal, truncate before, widest at joint 8 where it reaches the lower border of the depressed space (4), tapering behind nearly to a point; a central pale patch and distinct yellow border, produced as a subdorsal line behind, but not in front. Length, 2.6 to 3.7 mm.

Stage V.—(Plate VIII, fig. 9). Page 170, lines 31, 32, 39, 40 and page 171 lines 1 and 2, omit all reference to the coloration and read: green in front, the dorsal patch larger than before, more distinctly angled and pointed in front; it covers six depressed spaces and reaches on the sides to depressed space (5). There may be a small red patch on joint 3.

Stage VI.—(Plate VIII, fig. 10). Page 171, lines 8 to 13, omit all referring to the coloration and read: A large dorsal purplish red patch almost exactly as in the mature larva, but not reaching either extremity. Line 7 for "may have" read "has."

Stage VIII.—(Plate VIII, fig. 11). Page 171, lines 27 and 28, omit the words "from narrow to broad and." Omit also the references to the plate and the foot-note at bottom of page. Lines 36 and 37, omit "thus forming a large blurred red cross." There is no particular resemblance to a cross in *T. pallida*.

This JOURNAL, IV, pl. VI, figs. 5, 6 and 7 represent *T. testacea* not *T. pallida*. Compare the accompanying plate (Plate VIII, figs 8, 10 and 11) for the correct representation of *T. pallida*. Figs. 3 and 4 represent *H. flexuosa* not *T. pallida*.

Phobetron pithecium Abbot & Smith.

This JOURNAL, IV, 178. Add as reference to the larva, 1869—Mel-sheimer, Harris' Ent. Corresp., p. 112 (as *Oiketicus*).

Sisyrosea textula Herrich-Schäffer.

This JOURNAL, IV, 187. Add the following description of the freshly laid egg: Large, colorless, a little milky whitish, shining; 1.8×41 . mm. and almost without thickness (about .1 mm.); reticulations distinct, raised, whiter than the egg. Hatches in not less than ten days.

Stage I.—Mr. Joutel has seen this stage with the subdorsal horns of joints 6 to 12 degenerate, the rest normal. The degenerate horns had

three large, and a group of smaller setæ on joints 6 and 12, three large and other very rudimentary ones on joints 5 to 11. This is a most interesting variation as foreshadowing the condition of the more specialized species where but three setæ remain.

EXPLANATION OF PLATE VIII.

Tortricidia testacea.

- Fig. 1. Larva, stage I, dorsal view, enlarged.
" 2. Larva, stage IV, dorsal view, early in the stage.
" 3. The same, later in the stage.
" 4. Larva end of stage V.
" 5. Larva end of stage VI.
" 6. *T. testacea*, imago.

Tortricidia pallida.

- Fig. 7. Side view of mature larva.
" 8. Larva end of stage IV (compare fig. 2).
" 9. Larva end of stage V (compare fig. 4).
" 10. Larva end of stage VI (compare fig. 5).
" 11. Larva stage VII (compare this JOURNAL, IV, pl. VI, figs. 6 and 7).

LIFE-HISTORY OF CALYBIA SLOSSONIÆ.

BY HARRISON G. DYAR.

I am able to present descriptions of the remaining stages of this larva which, with those previously given by me, will complete the life-history. The previous article may be amended as follows:

This JOURNAL, V, p. 123, line 1, read . . . appendages of nearly equal length at maturity, the anterior ones a little shorter, but in stages II and III of unequal length as in *Phobetron*. Page 124, line 1 for "except that this character may not be primary," read: except that this character is a secondary adaptation.

Add: I have recently received a specimen of this species from Mr. Graef labeled "Texas."

DESCRIPTION OF THE SEVERAL STAGES IN DETAIL.

Egg.—Add: duration of this stage six days; 15 days in a cold room in New York.

Stage I.—Add: the dorsal and subdorsal brown lines are broken, existing as dashes on the weak segments 4-5, 7, 9 and 11; a slender brown marking between the horns of 4 and 13. Later a milky white shade along the subdorsal ridges, joining at the ends. Length, 1 to 1.5 mm.

Stage II.—Elliptical, flattened, dorsal space broad, level with the laterally extended horns; side area small. Horns 3, 4, 5, 8, 10, 12 and 13 short, tapering, as long as the width of the dorsum, those of joints 7, 9 and 11 very short, conic, less than half as thick and about one sixth as long as the others. Long horns with many fine, flexible, spinulose white hairs toward tip, but above and at base mixed with smooth straight setæ with dark tips. The short horns bend down and have only smooth setæ; the long horns are all equal. Color uniform translucent whitish green, in some with rounded brown dots on joints 4, 7 and 11 or 4, 7, 9 and 11 dorsally. The side area is covered by the subdorsal horns which are constricted a little at base, but are without separate basal pieces. Skin with clear setiferous granules as at maturity. The larva eats a channel in the leaf, in which it rests, the horns overlapping the uneaten leaf. Length, 1.5 to 3.1 mm. Duration of the stage 5 days.

Stage III.—Shape essentially as in the mature larva, the dorsal groove broad and shallow. Horns of joints 3 to 13 of even length except 7, 9 and 11 which are about half as long or a little over half as long as the others, thick, tapering, constricted near and at base, indicating the rounded basal pieces, but they are not furcate. Hair abundant, fine and spinulated as before with some smooth, dark tipped ones toward bases of horns; primitive setæ ii visible. Color all green, made whitish by the hairs. Skin as before. The horns are slenderer than before and look more numerous as those on the weak segments appear more distinctly. Length, 3.1 to 4.5 mm. Duration of the stage 5 days.

Stage IV.—Much the same. The short horns are now about nine-tenths the length of the others and during the stage they fill out and become almost completely indistinguishable. The hairs are almost all the spinulose ones, only a few of the smooth, black tipped ones remaining. Horns long and slender, a little swollen at base, the basal pieces constricted off and obscurely furcate. Setæ i and ii are distinct, on the basal piece and tip of horn respectively, smooth, dusky. Lateral horns minute, naked, tapering, enlarged at base and once constricted, concealed under the subdorsals. All green, usually no marks, sometimes with the dorsal red spots. The shade varies from leaf green to bluish

green. Head rounded, green with black ocellus and brown mandibles; width .8 mm. The horns are detachable as at maturity. Length, 4.5 to 7 mm.

Stage V.—Shape as in the mature larva, all the horns equal except joints 3 and 4 which are beginning to be a little shorter, that of 3 slightly recurved. Dorsal groove distinct, narrow; basal piece of horns distinct, cordate at base. Horns regularly tapering, rounded at tip, densely clothed with long, fine, white fringe-hairs. There are also some smooth, short, dark-tipped hairs and short, densely feathered, stellate ones especially toward the bases of the horns. Setæ i and ii long, smooth, black. Skin as at maturity. Color soft, clear green, more whitish along the dorsal groove. Nearly all the specimens (35) had lost the red spots at this stage, only one or two retaining them. Length, 7 to 10.5 mm.

Stage VI.—Mature larva. Length, 10.5 to 16.7 mm. The short smooth hairs on the horns represent the long smooth ones of the earlier stages; the short, very feathery hairs are those of the long feathery ones which lie on the dorsal aspect of the horns, made short. The larva here recorded probably omitted one of the normal stages. Probably the penultimate as in *Packardia geminata* (JOURN. N. Y. ENT. Soc. VI, 3).

It was kept very warm and was protected from the chill night air that it would have had on its native river. Consequently it grew very rapidly, probably more so than in nature.

Another larva reached 13.5 mm. before last molt which was doubtless this missing stage. It was like the final stage, but the coloration entirely green.

Food-plants. Add Marlberry (*Ardisia pickeringia*), cocoa plum (*Chrysobalanus icacoa*) and another plant not determined. I am indebted to Mr. F. Kinzel for the names and to Mrs. Slosson for sending leaves to feed the larvæ.

ON THE DIPTEROUS FAMILY SCATOPHAGIDÆ.

By D. W. COQUILLET, Washington, D. C.

This family is known in Europe as Scatomyzidæ, but since the genus *Scatomyza* is an admitted synonym of *Scatophaga*, it would appear desirable to change the name of the family to Scatophagidæ. In the

Osten Sacken catalogue it bears the name of Cordyluridæ, but since the genus *Scatophaga* is the oldest one in this family, it is desirable to name the family after it.

The European genera and species of this family have quite recently been monographed by Mr. Theodore Becker,* and a translation of his tables of subfamilies and genera, in an abbreviated form, is given by Dr. Williston in his recent manual. Owing to the faulty definitions of the subfamilies, whereby certain genera which possess a given character are placed in a subfamily in which this character is expressly stated to be absent, and the further difficulty of separating subfamilies by such Walkerian phrases as "face short," "face long," it will be quite impossible for the student to refer his species to its proper genus by the use of these tables, and I have therefore constructed an entirely new one which contains all of the genera belonging to this family known to me to occur in this country.

TABLE OF GENERA.

1. Front tibiæ destitute of an erect black spine on the inner side of each near the apex 2
 Front tibiæ each bearing such a spine, third antennal joint rounded at the apex, palpi destitute of an unusually long bristle at apex of each, one sternopleural macrochæta **Acanthocnema** *Becker*.
2. Third antennal joint produced in the form of a tooth at the anterior apical angle. . 3
 Third joint rounded at the apex 5
3. With three sternopleural macrochætæ, palpi destitute of an unusually long bristle at apex of each **Orthochæta** *Becker*.
 With two sternopleurals, palpi near apex of each bearing a bristle which is nearly one-half as long as the palpi **Chætosa**, gen. nov.
 With only one sternopleural, palpi destitute of a single long terminal bristle. . . 4
4. Palpi spatulate, about twice as long as wide. **Spaziphora** *Rond*.
 Palpi more than four times as long as wide. **Opsiomyia**, gen. nov.
5. Apex of palpi each bearing a single bristle which is nearly as long as the palpi, one sternopleural 6
 Apex of palpi destitute of such a bristle. 7
6. Head at least as high as long, face nearly perpendicular **Cordylura** *Fall*.
 Head flattened, noticeably longer than high, face very oblique, greatly retreating below **Acicephala**, gen. nov.
7. With only one sternopleural 8
 With two sternopleurals, frontal bristles strong, two or more pairs on anterior third of the front. **Hexamitocera** *Becker*.
8. Frontal bristles strong, two or more pairs on anterior third of the front.

Scatophaga *Meig*.

 Frontal bristles very short, none on lowest third of the front. **Hydromyza** *Fallen*.

* Berl. Ent. Zeitsch., May, 1894, pages 77 to 196.

DESCRIPTIONS OF NEW SPECIES, AND NOTES.

Scatophaga vulpina, sp. nov.

Black, the front except each side and an ocellar spot, face cheeks, first two antennal joints, arista, palpi, halteres and legs, yellowish, the bases of the front femora and a streak or more or less of the bases of the others, sometimes black; hairs of occiput, body and legs long and abundant, principally reddish-yellow, arista bare, humeral and dorso-central bristles except the posterior pair, very slender, scarcely distinguishable from the hairs, pteropleura bare, middle and hind femora destitute of stout macrochaetæ, hind tibiæ each bearing only two, situated near the middle of the front side; wings strongly tinged with yellow, the small and posterior crossveins bordered with brown; body subopaque, gray pruinose, the thorax and pleura mottled with brown. Length, 8 to 11 mm.

Point Barrow, Alaska. Five males and five females collected June 22, 1882, by Mr. John Murdock. Type No. 4096, U. S. National Museum.

Scatophaga furcata Say.

This is one of the few species introduced from Europe and described in this country before it was described in Europe. The synonymy is: *squalida* Meig., *apicalis* Curtis, *nigricans* Macq., *fuscinervis* Zett., *pubescens* Walk., and *Cleigastra suisterei* Townsend; the latter based upon a co-type specimen.

Opsiomyia, gen. nov.

The characters of this genus may be gleaned from the following description of the type species:

Opsiomyia palpalis, sp. nov.

Head slightly broader than high, as long as high, slightly longer at base of antennæ than at the vibrissæ, seven pairs of orbital bristles which extend from the lowest ocellus to the anterior end of the front, clypeus connate with the face and extending more than the length of the second antennal joint below the vibrissæ, the latter almost twice as long as any of the adjacent bristles, lateral oral margin bearing black bristles on nearly its anterior half; third joint of antennæ twice as long as broad, slightly more than twice as long as the second, the anterior apical angle produced in the form of a tooth, arista bare, thickened on the basal third, the penultimate joint slightly longer than broad; proboscis robust, palpi greatly flattened, of nearly an equal width but tapering at the base, five times as long as broad, projecting four-fifths of its length beyond the oral margin, each bearing a single long, black bristle near the middle of the outer side, eyes oblique, slightly higher than long, bare. Bristly hairs of body short and sparse, five dorso-central macrochaetæ, one sternopleural and four stout scutellar, none on the abdomen, all femora and tibiæ bearing several, hind tibiæ each with two pairs on the outer side besides those near the tip. Venation practically as in *Cordylura*, all veins bare. Black, the extreme

base of palpi yellow, remainder white, halteres, femora, tibiæ and tarsi yellowish, wings hyaline; face silvery white, body brownish gray pruinose. Length, 5 mm.

White Mts., N. H. Two males collected by the late H. K. Morrison. Type No. 4097.

Chætosa, gen. nov.

The type species is *Cordylura punctipes* Meig., of which the National Museum possesses two specimens from Minnesota, one from Colorado and two from Holland. This species could never be identified by the use of Becker's monograph, since he places it in the genus *Trichopalpus*, to which, both in the table of genera and in the definition of the genus, he attributes a single sternopleural macrochæta. The palpi are sub-lanceolate, slightly flattened, and at the apex of each is a black bristle which is much longer than any of the adjacent ones.

Acicephala, gen. nov.

Closely related to *Cordylura* but readily distinguishable by the elongated, flattened head and very oblique face. Type, the following species:

Acicephala polita, sp. nov.

Black, the face, cheeks, palpi, halteres, coxæ, femora, tibiæ and tarsi, yellowish; front, except the ocellar triangle, inner side and apex of second antennal joint, face, cheeks and pleura white pruinose, the occiput, mesonotum, scutellum and abdomen, polished; second joint of antennæ prolonged over the inner side of the first nearly to the arista, the third joint two and one-half times as long as broad, only slightly longer than the second, arista rather long plumose, thickened on the basal fifth, the penultimate joint broader than long; eyes bare, nearly perpendicular, only slightly higher than long; vibrissæ more than twice as long as the adjoining bristles, lateral oral margin bearing three or four black bristles on its anterior half; palpi clavate, slightly flattened, bearing several long yellowish bristles near the middle, a few short black ones at the tip besides one which is nearly as long as the palpi; proboscis robust, only slightly over twice as long as thick. Mesonotum almost destitute of bristly hairs, five stout dorso-central macrochætæ, one prothoracic, one sternopleural, and two on the scutellum; abdomen less polished than the mesonotum, destitute of stout macrochætæ, its hairs black, those on the venter except at the apex, whitish. Wings hyaline, tinged with brown along the veins, third and fourth veins toward their apices parallel, the fourth ending far beyond the apex of the second, small crossvein beyond the middle of the discal cell, and far beyond the tip of the first vein, all veins bare. All femora and tibiæ bearing macrochætæ, hind tibiæ each bearing three pairs on the outer side beside those at the tip. Length, 7 to 8 mm.

Colorado. One male and three females. Type No. 4098.

Acicephala pilosella, sp. nov.

Same as the above description of *polita* with these exceptions: Face, cheeks, palpi, coxæ and femora black; pruinosity of front, face, cheeks, and pleura, brownish

gray and not dense, none on the second antennal joint, mesonotum sparsely covered with short yellow hairs, only one pair of dorso-centrals, the prothoracic bristle yellow, hairs of the first three segments of the abdomen in the male, of the first six in the female, yellow, apex of sixth segment in the female bearing six stout macrochaetae. Wings not tinged with brown along the veins. Hind tibiae each bearing only two pairs of macrochaetae on the outer side. Length, 6 to 7 mm.

Colorado, and Reno, Nevada (H. F. Wickham). One male and two females. Type No. 5002.

***Cordylura nebulosa*, sp. nov.**

Black, the front except the sides and the ocellar triangle, dark brownish yellow, sides of front, face, cheeks, lower part of occiput and the palpi, white, first two antennal joints, proboscis, halteres, coxae, femora, tibiae and tarsi yellow; third antennal joint one and one-third times as long as wide, arista short pubescent, vibrissae short, yellow, a yellow bristle of nearly the same length below each. Mesonotum and scutellum opaque gray pruinose, five dorso-central macrochaetae, scutellum bearing four stout ones; pleura on the lower part gray pruinose, the upper part and the abdomen polished, the latter destitute of stout macrochaetae, its hairs yellow. All femora and tibiae bearing stout macrochaetae, hind tibiae each with three on the outer side besides those at the tip. Wings hyaline, the costal cell beyond the humeral crossvein, a border to the first vein beyond base of the second, and a large spot extending from apex of first vein to slightly beyond the apex of the fourth, brown, sometimes a hyaline vitta in the marginal cell, a triangular hyaline spot near apex of the submarginal and first posterior cells; small crossvein near last third of the discal cell. Length, 5 mm.

Algonquin, Ill. Two female specimens collected June 2 and 6, 1895, by Dr. W. A. Nason. Type No. 4099.

***Cordylura slossonae*, sp. nov.**

Black, the lower half of the front, antennae, face, cheeks, lower part of occiput, palpi, proboscis, under side of the prothorax, halteres, apical lamellae of the genitalia, coxae, except a spot on the outer sides of the middle and hind ones, femora except apices of the middle and hind ones, tibiae and tarsi, yellow. Third antennal joint one or two-thirds times as long as wide, arista long plumose on the basal half, thickened on the basal sixth, lateral oral margin ciliate with yellow bristly hairs. Mesonotum, scutellum and abdomen polished, sparsely covered with yellow hairs, one pair of dorso-central and scutellar macrochaetae, abdomen destitute of stout macrochaetae except at apex of the sixth segment; pleura gray pruinose, one sternopleural macrochaetae, those of the prothorax and mesopleura slender and yellow. Front and hind femora destitute of stout macrochaetae, those of the front tibiae slender and yellow, under sides of femora and inner sides of tibiae thickly covered with long yellow hairs. Wings hyaline, small crossvein near last third of the discal cell. Length, 7 mm.

Mt. Washington (Mrs. A. T. Slosson) and White Mountains (H. K. Morrison), N. H., and Beverly, Mass. (Edw. Burgess). Four male specimens. Type No. 5000.

Hexamitocera vittata, sp. nov.

Head yellow, an oblong ocellar spot and a wide stripe extending from the upper part of each eye to the neck, dark brown; antennæ brown, the first two joints and base of the third yellow, third joint two and one half times as long as broad, arista pubescent, palpi and proboscis yellow. Thorax yellow, the mesonotum, scutellum, metanotum and a vitta beneath each wing, dark brown, polished, the mesonotum marked with four yellow vittæ; two pairs of dorso-centrals, one pair of scutellar, two prothoracic and two stenopleural macrochaetæ. Abdomen polished, dark brown, the hypopygium and the posterior margin of each segment, except the first, yellow, the hairs black, a few macrochaetæ along the sides. Legs yellow, front and middle femora ciliate on the under sides with black bristles. Wings grayish hyaline, small crossvein slightly beyond middle of discal cell. Length, 6 mm.

Colorado. A male specimen. Type No. 5001.

**COCCIDÆ COLLECTED IN MEXICO BY MESSRS.
TOWNSEND AND KOEBELE IN 1897.**

BY C. H. TYLER TOWNSEND AND T. D. A. COCKERELL.

The following are species jointly studied by us (with certain exceptions duly noted) in working over the two lots of coccid material collected in Mexico by Messrs. Townsend and Koebele during 1897, which were sent to us for determination by the United States Department of Agriculture. An author's initials, bracketed at the end of a species, mean that the entire text under that species is to be accredited to that author alone. The work of mounting the specimens, drawing up the descriptions, and finally of preparing and writing the entire manuscript, was done by Mr. Townsend. Some notes on the forms of *Icerya purchasi*, based on material not represented in the above two lots, and also the description of a Brazilian species of *Capulinia*, are included in the paper, having developed in connection with the study of the other material.

Icerya purchasi Mask.

Typical form (= *crawi* Ckll.).—On citrus trees in Magdalena, Sonora, Sept., 1894 (Townsend). Thriving colonies of the typical *purchasi* were found here, and must have been introduced from California. This, however, is so far the only authentic recorded locality for typical *purchasi* in Mexico. (See remarks under var. *maskelli* which follows.) [C. H. T. T.]

Icerya purchasi var. **maskelli** Ckll.

On trunks of several orange trees at Aranjuez, six miles from Guaymas, Sonora, Sept. 23, 1894 (Townsend).^{*} This is the form that I took at Guaymas, and which has been published as *purchasi*. The specimens are noticeable for their small size and short subconic ovisacs.

The larval characters of *purchasi* (typical form) and var. *maskelli* do not differ appreciably except in the antennæ of first stage, and this difference is not apparently constant. Mounts were made of larvæ of *purchasi* (typ. form) from California and Magdalena, Sonora; and of var. *maskelli* from California and Guaymas, Sonora. The two mounts from California and that from Magdalena show the antennæ of first larval stage practically the same; *i. e.*, the last joint is irregular in outline, and the penultimate, as well as last joint, bears one or two of the very long hairs. The Guaymas mount, being from the present specimens, shows the last antennal joint of first larval stage almost uniformly to be rather swollen and regular in outline, well constricted at base, rather soda-bottle shaped, and with none of the long hairs on penultimate joint. But some specimens occurred exhibiting a tendency toward the other form, so that the character can hardly be called distinctive.

The difference between the typical *purchasi* and var. *maskelli* were pointed out by Cockerell in *Psyche*, July, 1897, under the heading "note on two forms of the fluted scale." These forms were recognized by Craw some seven years ago as differing from each other, and have ever since been noticed by him to retain their distinctive features. The finding of the present specimens, which seem to be an exaggerated *maskelli* form, near Guaymas, Sonora, suggested the possibility that *maskelli* might represent an endemic American form, not in any way connected with the Australian *purchasi*. This supposition fell after making an extended examination of the larvæ, which could not be satisfactorily separated (at least the Californian specimens could not), so that the two forms could hardly be natives of two widely separated countries. It is still possible, however, that the present specimens from Guaymas may represent an endemic form related to *purchasi*, and thus a new species, but I do not consider it probable.

The statement of Cockerell (*Psyche*, l. c.) that *maskelli* is *purchasi* in the strict sense, and agrees very nearly with Maskell's description,

^{*}These specimens were in all probability what I collected near Guaymas, but unfortunately they were sent out from the Department without label. I can state positively that I collected exactly similar specimens, so far as external appearance goes at the locality given.—C. H. T. T.

needs correction. It is *crawi* which agrees very perfectly with Maskell's description, and *maskelli* agrees very poorly. A photograph taken by Craw, in San Francisco, of Californian specimens of the two forms side by side, in situ on the branches, shows the differential characters very clearly. *I. purchasi* has the body covered, usually conspicuously, with a white or yellowish mealy secretion; the ovisac long, stout and sub-cylindric, the whole form of sac and insect robust; the edges of body with curled cottony filaments often of some length and pronounced, and the long glassy filaments normally present and conspicuous. *I. maskelli*, on the other hand, has the body usually nearly bare, dark in color; the ovisac short rounded subconic, being very conspicuously abbreviated compared with *purchasi*; the whole form much less robust, the edges of the body quite destitute of curled cottony filaments, and the long glassy filaments usually inconspicuous. [C. H. T. T.]

***Icerya montserratensis* Riley and Howard.**

On leaves of avocado pear, Tampico, Jan. 26, 1897 (Townsend). Div. Ent., No. 4708. Only one adult ♀, but many young.

***Icerya palmeri* Riley and Howard.**

One adult ♀, on *Coursetia* sp., * near Guaymas, Sonora, April 23, 1897 (Koebele, 1714), Div. Ent., No. 7893. This is the first and only adult specimen of *I. palmeri* known. As the specimen is an unique, it was decided not to boil it for a study of the adult ♀ anatomical characters. Unfortunately the antennæ were broken, so that it is impossible to say whether it possesses 9-jointed or 11-jointed antennæ, and therefore it can not yet be referred to its proper subgenus.

Length of scale including ovisac, over 11 mm. Greatest width of body and of ovisac, 5 mm. Width of ovisac at extremity, 4 mm. Height of insect, 4 mm.; of ovisac, 4½ mm.

Adult ♀. Body red; legs and antennæ black, covered as well as venter with a white mealy secretion. Edge of body with moderately long curled filaments of white secretion, a central dorsal patch of filamentous secretion being variegated with pale sulphur-yellow. No glassy filaments on body apparently.

Ovisac pure white, not fluted, presenting a smooth lime-like surface, large and stout, 8 mm. long below and 7 mm. above. The species resembles *rileyi* in its smooth unfluted ovisac.

Several larvæ extracted from the ovisac demonstrated the fact of this species being *palmeri*. The median constriction of last antennal joint of first larval stage is pronounced and seems a constant character. The

* The name was spelled *Cocersitia* on label. Presumably *Coursetia* was intended.

wax of first and second larval stages is pure white. The characters agree perfectly with Riley and Howard's description. A specimen of the second stage of ♀ larva was also obtained from within the ovisac, and shows two long hairs, a little shorter than width of body, sticking straight out from sides of body, well removed from each other. These were doubtless broken off from the dried cast larval skins, from which the original description and drawings were made. The several hairs on last antennal joint of first larval stage are somewhat longer in some cases than in the figure. The broken stumps of the pair of cephalic hairs between bases of antennæ appear in one specimen, but do not show in the others. [C. H. T. T.]

***Icerya rosæ* Riley and Howard.**

Seven ♀ specimens, all apparently adult, taken on bark of trunk of a tree which may have been *Prosopis* sp., in plaza at market place. Tehuantepec City, Oaxaca, May 26, 1896 (Townsend). Div. Ent., No. 7222. It is curious to note that the anatomical characters of the adult ♀ of *rosæ* are the same as those of *purchasi*; the antennæ of *rosæ* have been stated by Riley and Howard to be the same as *purchasi*, while an examination of the present specimens shows them to agree perfectly in all the other anatomical characters with the description of *purchasi* given by Comstock. The validity of *rosæ* stands on the absence of ovisac, absence of curled filaments of secretion on border of body, and absence of fine glassy filaments on body. Boiling in caustic soda gives first a pronounced rose-color, then a rose-brown.

***Icerya littoralis* Ckll.**

One adult ♀ on bark of tree which may have been *Prosopis* sp., in plaza at market, Tehuantepec City, Oaxaca, May 26, 1896 (Townsend). Div. Ent., No. 7222. The egg-sac is short, and is distinctly yellow on circumference of basal half. There is no sign of the fine glassy filaments of the body in this species. The fluffy waxy secretion enveloping the eggs and newly-hatched young is whitish, but the inside of the wall of egg-sac shows conspicuously yellow. The wax of first stage of larva is apparently quite pure white. The last antennal joint of first larval stage, taken from ovisac of present specimen, and from sacs of *littoralis* typical form, shows a slight constriction in middle, thus exhibiting a tendency toward *palmeri*. The first larval stage of *littoralis* has the third antennal joint uniformly the same as 1, 2 and 4, the approximate formula being 6 (1234) 5; while *palmeri* has the third joint uniformly longer than 1, 2 and 4, the formula being 63 (124) 5. The

antennæ of first larval stage of *littoralis* var. *mimosæ* Ckll., differ from typical *littoralis* in the more uniformly stout basal joints and stout last joint, the intermediate joints being narrowed, giving the antennæ a constricted appearance in the middle. In typical *littoralis* the basal joints seem nearly as narrowed as the intermediate ones. Both the typical form and var. *mimosæ* have the last antennal joint of first larval stage with several (about 3) very long hairs. Both also have the lateral bristles of border of abdomen anterior to anal bristles, in first larval stage, well differentiated from other lateral hairs, thus falling in the group with *rosæ*, *montserratensis* and *palmeri*.

The antennæ of adult ♀ were both broken, one showing nine joints, the ninth joint being fractured and the distal portion missing. But the identity of the newly hatched larva with that of *littoralis* proves the determination beyond doubt.

Ortonia primitiva, sp. nov. *Towns.*

Differs from *O. mexicanorum* Ckll. as follows: Antennæ only 9 jointed, less than twice as long as femur plus trochanter, more than twice as long as femur alone, the first five joints being about equal in length to the femur plus trochanter. Approximate antennal formula, (39) (21) (678) (45). Ninth is not as long as seventh and eighth together. The only joints that are broader than long are 1, 2, 4 and 5. Joints 3, 6, 7 and 8 are about as broad as long. In some cases 8 seems a little longer than 6 and 7. The last three joints are approximately equal in width, while the other joints gradually narrow proceeding toward the base. Joint 1 is perhaps $\frac{2}{3}$ wider than 2. Tibia more than $\frac{1}{4}$ longer than femur, and but little more than $\frac{1}{3}$ as broad as femur, being rather slim. Tarsus (not including claw) about $\frac{1}{2}$ length of tibia, with about seven spines in a line on inner edge, tibia with about ten such spines. Claw apparently with a short stout rudimentary digitule. Under and outer edge of claw on each side delicately scalloped, showing four scallops. No bristles apparent on claw. Integument showing the large round and oval hyaline spaces said to be characteristic of the genus, and thickly covered everywhere with numerous long strong spines interspersed with shorter ones. Boiling in KHO stains the liquid brown. Length of ♀ after boiling, about 5 or 6 mm.; dried unboiled ones are 3 mm. long, by 2 mm. wide. One of the larger specimens is accompanied by a considerable amount of pure white, fluffy, cottony secretion, which may form a substitute for an ovisac in this species. This cottony secretion, which does not seem to be present in *mexicanorum*, together with the presence in the debris of small orange colored eggs, indicates that the material is adult.

This species and *mexicanorum* need the erection of a separate subgenus for their reception, perhaps two subgenera. I propose the name *Protortonia* for the present species, and it may even be found to merit generic rank, as being quite distinct from *Ortonia*. For the present, *O. mexicanorum* can be included in it also.

On "nettle tree," Cuantla, Morelos, May 31, 1897 (Koebele). Div. Ent., No. 7878. The nettle tree, as stated elsewhere in this paper, is probably *Manihot* sp. [C. H. T. T.]

Cerococcus corticis, sp. nov.

Adult ♀. Elongate-globular, balloon-shaped, apodous and without antennæ, integument whitish and transparent after boiling; anal cone chitinous, yellowish at base, brownish on terminal margins, wide and stout, conico-cylindric, about as long as basal width, less in diameter at discal end than at base, the margin deeply notched on ventral and dorsal aspect, the notch reaching to about middle of length of cone, the margins with a row of strong bristly hairs curved at ends, the lateral lips externally rather thickly clothed with the same extending down about $\frac{3}{4}$ way to base of cone. Between bases of lateral lips of cone inside appears what is evidently a median tubercle though not distinct, corresponding to the median tubercle situated between the two elongate caudal tubercles of *C. quercus* Comst. Anal ring concealed, but the stout, long cylindric hairs arising from it are conspicuous, six in number (3 pairs), and reach well beyond ends of lateral lips of cone. In a younger specimen these hairs reach fully as far beyond ends of lips as depth of notch of anal cone. In a still younger specimen they are not apparent at all. The clear light yellow surface of basal part of cone shows a pair of brownish spots on either side, the inner pair much the larger. Spiracles distinct. Mouth parts large and well-developed; ♀ full of large well-developed ova. Length of ♀ on slide, nearly 2 mm.; width, $1\frac{3}{8}$ mm.

♀ Scale white, irregularly oval in form, seed-shaped or bead-shaped, covered wholly with a waxy secretion which has a felted, sometimes cottony, appearance on the surface. Length, 2 to $2\frac{1}{2}$ mm.; width, about $1\frac{3}{8}$ mm.; thickness, about 1 to $1\frac{1}{2}$ mm. Apparently stuck into the surface of the rough bark.

On bark of *Quercus engelmanni*, Nogales, Sonora, April, 1897 (Koebele). Div. Ent., No. 7880. Professor Cockerell had determined this species rather hastily as *C. ehrhorni*, and Mr. Pergande called attention to the fact that it was very different in appearance and must be distinct. As will be seen, the anal characters show the species to be very distinct from *ehrhorni*. It will be well also to note the very marked difference between *corticis* and *quercus* in the anal characters, as shown in Comstock's figure of the latter.

Phenacoccus gossypii, sp. nov.

Sac pure lime white; length, 5 to $6\frac{1}{2}$ mm.; width, 2 to $2\frac{1}{2}$ mm.; parallel-sided, more widened, larger and stouter than in *helianthi*, and the body of ♀ not apparent at one end, the sac wholly covering the body. Boiling in caustic soda does not stain the liquid.

Adult ♀. Length of body, 3 mm. Approximate antennal formula 2 (39) (145678). The antennæ and legs are practically the same as in *helianthi*. The digitules of the claw are distinct, rather slender, well knobbed, and extending beyond the end of the claw about $\frac{1}{4}$ the length of the latter. Antennæ and legs pale brown.

This species may be considered as taking the place in tropical Mexico of *helianthi*, which is found in northern Mexico, Texas and New Mexico. While *helianthi* affects *Helianthus*, *Pluchea*, etc., in the temperate region just named, *gossypii* affects cotton and other malvaceous plants in the tropical region to the south. Probably the specimens found by Townsend on cotton at Santa Maria, Texas, May 7, 1895, and identified by Tinsley as *helianthi* var., are nearly or quite the same as the present form.

P. helianthi and *gossypii* both differ from *yuccæ*, the only other described Mexican *Phenacoccus* in lacking the characteristic dark coloring of the antennæ and legs. They may be separated from each other by the sac characters already given.

Massed on stems, stalks and leaves, mostly on underside of latter at base of cultivated ornamental plant called, "amistad," which is very closely allied to cotton and is probably a species of *Gossypium*. Frontera, Tabasco, June, 1897 (Townsend). Div. Ent., No. 7820.

Also specimens on twigs, leaves and squares of cotton, Frontera, Tabasco, June, 1897 (Townsend). Div. Ent., No. 7811. From this material only a single adult ♀ was obtained. It agrees in every respect with the specimens from amistad, except that the second and third antennal joints are equal in length. Only the first six of the antennal joints are represented in the specimen; the formula for these would be (23) 1 (456). The sacs are typical.

Var. *a*.—Sacs have same general characteristics and appearance, but are uniformly smaller than in typical *gossypii*. Length of sac, 3 to 5 mm.; width $1\frac{1}{2}$ to 2 mm. The legs, including digitules of claw, are same as in *gossypii*. So also are the other characters of the ♀, except-only those of the antennæ, the second and third joints of which are normally quite equal; the approximate antennal formula is 23 (19) (45678).

Greatly massed on branches, twigs, stems, and leaves of *Mimosa* sp., called "sarsa," Las Islas del Rio Usumacinta, some 20 miles or more above Frontera, Tabasco, July 9, 1897 (Townsend). Div. Ent., No. 7281. The plants were growing on the edge of the river, and were partially submerged at the time by the high water.

Subsequently to writing the above, Professor Tinsley has carefully studied these forms of *gossypii*, and compared them with *helianthi*. His investigation convinces him that no antennal or other structural character of the adult ♀ will serve to differentiate *helianthi* and *gossypii*. The easily noticeable differences in external appearance are, however, sufficient to separate them.

Prosopophora manihotis, sp. nov.

♀. Scale suborbicular, averaging about 3 mm. long, by $2\frac{1}{2}$ mm. wide, and $1\frac{1}{4}$ to $1\frac{1}{2}$ mm. high. Color sordid yellowish-white or brownish-gray. Surface rugose near margin, dorsal surface faintly transversely ribbed, three longitudinal rows of slight tubercles more or less distinct; in some specimens the dorsal surface is worn smooth. Scale with conspicuous traces of a whitish chalky secretion. Boiled in KHO gives the liquid a reddish or brownish color. The dried females under the scales are black.

♀. Antennæ 8-jointed, moderately stout, gently tapering; first joint about twice as wide as long, second a little wider than long, third a little longer than wide, second and third about equal in width and considerably narrower than first; fourth considerably narrower than third, about half again as long as wide; fifth still narrower but not twice as long as wide; sixth shorter than fifth, and seventh shorter than sixth, seventh being slightly wider than long; eighth joint knob-like, circular in outline, surmounted by several hairs, diameter less than width of seventh. Usual antennal formula approximately (34) 5 (612) (78); varying in one case to (34) (512) 6 (78).

Spines of integument large, long and sharp. Double glands of integument not of the usual figure-eight form, but bent half double, thus presenting the outline of a pair of short ears. The integument shows the rod-like structures very numerous and rather stout, the whole surface being covered with them.

On bark of "nettle tree" (so called on label), Cuantla, Morelos, May 31, 1897 (Koebele 1757). Div. Ent., No. 7910. As there is no other possible plant in the tropics of Mexico, so far as I know, which could be called a nettle tree, other than what is known as the "mala mujer," which is a species of *Manihot* (or *Jatropha*), I take it that this is the plant in question. It especially merits the name of nettle, and assumes tree-like dimensions. Its spines are extremely irritating if only barely touched to the skin. The bark on which the scales occur resembles perfectly that of this giant nettle. [C. H. T. T.]

Tachardia nigra, sp. nov.

Single specimens show the lac to be disposed in a more or less stellate form covering the body of the female, the stellate shape being due to the similar shape of the body of the female. Usually, however, the specimens are massed together on the branches, being so close to each other that the lac becomes confluent, joining the specimens and presenting the form of irregular elongate globular masses more or less confluent. The lac usually has a decided blackish surface color, unlike any hitherto known species of the genus; it varies to dark brown in some cases, however. Average diameter of single specimens covered with lac, 3 to 4 mm.; height, 2 to $2\frac{1}{2}$ mm. Boiling the lac in KHO gives a dark crimson lake color.

♀. Spine is very long and thorn-shaped, perfectly regular in outline, widened at base, gradually tapering from near base to point, in length probably more than four times extreme basal width (the point in specimen studied is broken off). Perforated

plate of lac-tube subcircular; group of glands elongate-oval, widened end of group contiguous to border of plate; glands oval, closely packed. Anal tubercle prolonged at sides into long spine-like processes only a little shorter than width of tubercle at their origin, and longer apparently than the caudal filaments which are to be seen between them. The specimens are evidently adult. The lac of young specimens is disposed in a perfect star-like form, and the color is reddish-brown.

On branches of *Acacia* sp., Orizaba, Vera Cruz State, July 15, 1897. (Koeble 1721). Div. Ent., No. 7927.

Tachardia mexicana *Comst.*

Lac in color reddish-brown, shaded to reddish-yellow.

♀. Antennæ 6-jointed, formula (23) 4 (15) 6, stout, outwardly bowed, nearly equal in width throughout, first joint a little wider than rest; sixth joint narrowest, rounded, very short; second and third about as long as wide.

On branches of *Mimosa* sp., Oaxaca, Oaxaca State, August 21, 1897. (Koebele 1664). Div. Ent., No. 871. [C. H. T. T.]

Capulinia sallei *Sign.*

Adult ♀. Antennæ very short, atrophied, represented by a mere tubercle, not as high as broad, surmounted by several (about 4 to 6) hairs, not chitinous. Mouth parts large and well developed. Legs atrophied, front and middle pairs represented by a sharp conical stump, chitinous, triangular in outline, but little longer than basal width, usually distinctly 3-jointed, the third joint point-like. Hind legs nearly twice as long as others, of same structure, form and outline, except that they are nearly twice as long as basal width. The two stigmata on each side of body distinct, chitinous. Anogenital ring small, chitinized on its edge, without hairs; the integument thickly clothed all around it, within a radius of 8 to 10 times diameter of chitinous portion of ring, with what appear like short hairs but are probably minute elongate glands or tubular spinnerets, giving the area a thickly dotted appearance which ends abruptly. The specimens studied, after being boiled, measure $1\frac{1}{2}$ to $1\frac{2}{3}$ mm. in diameter. They boiled clear easily. Boiled in KHO stains liquid greenish-yellow.

♂. What is apparently the male scale is creamy-white, cottony but of close texture, entirely covering the immature male, subquadrangular in dorsal outline, a little flattened, and $1\frac{1}{2}$ to nearly 2 mm. long, by $\frac{3}{5}$ to $\frac{4}{5}$ mm. wide. An immature male pupa shows a broad stout chitinous anal horn, twice as long as width at origin, rather bluntly pointed, triangular in outline, and with a long strong chitinous spine approximated to it underneath, taking its origin on ventral surface at a distance anterad of origin of anal horn equal to fully or a little more than the length of latter, the point of spine reaching beyond the middle of length of latter and parallel with it. The legs are well developed; femora, tibiæ and tarsi rather swollen, coxæ and trochanters narrowed, the femora thinly and the tibiæ and tarsi more thickly clothed with minute bristles, the tarsi with a well-formed claw at end. Femur plus trochanter distinctly shorter than tibia plus tarsus. The long many-jointed antennæ do not show the segmentation distinctly enough to be described. The length of the pupa, as mounted, is $1\frac{1}{5}$ mm.

I have no doubt that this is Signoret's species. Not only do the

adult ♀ characters agree perfectly, as figured and described by Signoret, but the description of the appearance of the adult ♀'s in life, in situ on the food plant, agrees perfectly, the ♀ being covered with a cottony secretion and bearing pendant from the oval end a single long cottony filament.

Found on leaves and twigs of a wild shrub or small tree called "escobillo," in woods, Arroyo San Isidro (near Frontera), Tobasco, May 27, 1897 (Townsend). Div. Ent., No. 7659. The cottony filaments hanging pendant from the ♀'s reached a length of something like three inches.

This rediscovery of *Capulinia sallei* is of great interest, not only *per se*, but further as throwing much light on the affinities of several more recently described allied genera. The study of the present material has demonstrated the close relationship of *Capulinia* with *Sphærococcus* Mask. (1891), and *Xylococcus* Loew (1882). Both *Capulinia* and *Xylococcus* fall in the *Idiococcinæ* of Maskell, and in fact could both be included in the genus *Sphærococcus* as characterized by that author. However, the genus *Sphærococcus* may be maintained for forms of the *S. casuarinæ* Mask. and *acaciæ* Mask. type, while *S. inflatipes* Mask. needs the erection of a separate genus for its reception. *S. bambusæ* Mask. has already been referred to *Antonina*. Other species described since by Maskell as *Sphærococcus* will need similar revision. *Xylococcus filiferus* Lw. of Austria, resembles *Capulinia sallei* in the presence of the long pendant cottony filament of ♀, but apparently differs in the presence of an anal cone and other minor characters. The genus *Sphærococcus*, as above restricted, will include such forms as have the feet entirely absent in the adult ♀, and the antennæ either absent or rudimentary. *Capulinia* will include forms in which not only the antennæ, but also the feet, at least the posterior pair, are represented in more or less rudimentary form, and are not entirely absent. While both the feet and antennæ are said by Loew to be wanting in *Xylococcus*, the latter genus will remain distinct from *Sphærococcus* by its chitinous anal cone or tubercle. [C. H. T. T.]

The description of the following Brazilian species is included here while on this genus:

Capulinia jaboticabæ* Von Jhering.

Adult ♀. Round-oval in outline, $\frac{4}{5}$ to 1 mm. in length. Differs from *C. sallei* as follows: Antennæ more developed but still rudimentary, about twice as long as

* We had named this species after Dr. Von Jhering, but in the meanwhile he has (Revista Agricola, June 1898, p. 188) proposed to call it *Capulinia jaboticabæ*. Dr.

wide, distinctly 4-jointed, joints 1 to 3 more than twice as wide as long, last joint narrower and irregular with several hairs. Another specimen, probably of a previous moult, shows five joints in the antennæ. Front and middle pairs of feet entirely absent, without tubercular rudiments. Hind legs quite well developed, distinctly segmented, not tubercular but elongate; coxa subtriangular, as long as basal width, wide; femur (plus the small trochanter) wide, but only about two-thirds as wide as base of coxa, about as long as length of coxa; tibia narrower and a little longer than femur; tarsus tapering, fully as long as tibia, without apparent claw. In the immature specimen above mentioned the femora are relatively wider compared with the coxæ.

Brazil, probably Sao Paulo (Dr. H. von Jhering). On *Myrciaria cauliflora*. This is a very distinct species from *C. sallei*, in the complete absence of front and middle legs, and the comparatively well developed hind legs.

Lichtensia mimosæ, sp. nov.

Length of shrunken ♀, $3\frac{1}{2}$ mm.; of ovisac, 12 to 13 mm. Width of ovisac, 4 to $4\frac{1}{2}$ mm. Ovisac white, compact, surface with a satiny lustre, nearly parallel-sided, not ribbed or keeled, normally covering the insect.

Antennæ rather short, eight-jointed, without noticeable hairs except what appear to be two short ones at tip, second joint considerably shorter than third which is longest, fourth and fifth nearly equal and shorter than third, sixth about as long as second, seventh and eighth but little shorter. Approximate antennal formula 3 (45) (26) (78) 1. Tarsal digitules very long, slender, more than twice as long as the claw, not greatly knobbed. Digitules of the claw very stout, one quite equally thickened and not greatly widened at end, while the other is narrowed in the middle and club like at end. Claw digitules as long as the claw, which is rather large. Tarsus a little more than one-third length of tibia; femur markedly longer than tibia. Anal plates together forming a square, the outline of each being a right-angled triangle, each with two short hairs at posterior end. Integument with numerous oval or usually nearly spherical glands, the smaller ones so massed as to give a finely granulated appearance. Marginal spines small and simple, but fairly stout, about or hardly as far apart as their length.

As compared with *Lichtensia lutea* Ckll., from Vera Cruz on *Croton* being the only previously known tropical Mexican *Lichtensia*, the present species differs markedly in the claw digitules, besides having the ovisac pure white instead of lemon-yellow. In *L. lutea* the claw is smaller, and the digitules of the claw are about twice as long as the latter.

Occurring singly on branches of *Mimosa* sp., locally called "sarsa," Las Minas, near Frontera, Tabasco, June 4, 1897 (Townsend). Div. Ent., No. 7810.

Noack has also sent me some specimens *in situ*, collected by Dr. Campos Novaes at Itatiba, State of St. Paulo, and I find they live in little crater-shaped galls. The females have the antennæ with 5 or 6 segments.—T. D. A. C.

Ctenochiton aztecus, sp. nov.

Length of ♀ scale, 2 to $2\frac{1}{2}$ mm.; width, $1\frac{1}{2}$ to 2 mm.; height, 1 mm. or a little less; in form convex, and leaving a very conspicuous white silk-like covering on the bark when detached. Boiling in KHO gives a pale brown color. The secretion of ♀ is glassy in appearance, and has the characteristic serrate fringes on the edge. The marginal fringe shows 12 to 15 short teeth on each side. The adult ♀, after being denuded of the glassy secretion, is brown, but loses its color by boiling in KHO, except the anal plates and adjacent edges of cleft which remain brown. Integument shows a reticulated or honeycombed structure. Female apparently apodous and without antennæ. Marginal bristles extremely short, stout, and pointed, about as far apart as twice their length, but varying. Anal plates triangular, taken together hardly or nearly forming a square. Anal cleft deep, in some about one-fifth the length of whole body, in others less. Two bristles at end of each anal plate, and one on inner edge. Two longer bristles springing from their junction inside. The females are full of larvæ.

Glassy secretion is minutely irregularly striate, but shows no distinct air cells; it is raised on the dorsal surface into tubercular processes, showing especially in the more immature individuals. In the latter the processes take the form of a median dorsal row, a marginal row, and a row on each side half way between the dorsal and marginal.

On bark of trunk of tree called "cafetilla cimarron," which means wild coffee, but the tree is very distinct from coffee. Arroyo San Isidro, near Frontera, Tabasco, May 27, 1897 (Townsend). Div. Ent., No. 7645.

Ceroplastes roseatus, sp. nov.

♀ scale. Greatest length, 11 mm.; greatest width, 8 mm.; height, 6 mm. Color pale sordid yellowish, with a very faint rose tinge. Younger (smaller) specimens measure 7 to 9 or 10 mm. in length, and show the wax clearer, whitish with a pronounced roseate tinge or blush. Wax not divided into plates, no nuclei present. Form in lateral profile low conical with the apex rounded, the two sides meeting at a little more than a right angle; in anterior profile the sides meet at less than a right angle. The younger more roseate scales, with the fresh appearance to the wax, are not so symmetrically formed, the anterior margin of the wax being lapped up in front, and presenting just posterior to this a deep notch in the profile. Median dorsal tubercle of the wax is pale yellowish. Margin a little scalloped in dorsal profile, showing about seven projections of the border. Thickness of wax at base, 3 mm. at ends, averaging 2 mm. at sides. Surface of wax smooth, a little roughened in the largest specimens.

Body of ♀, before being boiled, denuded of wax (basal measurements), 4 mm. long, $2\frac{1}{2}$ mm. wide; this being a specimen which measured $9\frac{1}{2}$ mm. in length with wax in situ. Dorsal tubercle prominent, high, narrow, but widened (or rather lengthened) longitudinally, the sides giving the outline in lateral profile of a perfect angle of 55 degrees. Sides of body showing seven distinct lateral tubercles, the anterior one being in the middle. Caudal horn very elongate and stout, about 2 mm. long, and $\frac{4}{5}$ mm. in diameter at base. Color of dorsum brownish-red; the caudal horn black, becoming brown at base. Boiling in KHO gives a faint rosy tinge.

♀. Capitate spines of integument present same form as in *ceriferus*. Claw short, digitules of claw about twice as long as claw, unequal, one very stout and that knob extremely large, the other more slender and widened or flattened leaf like at end. Femur rather stout, swollen, rather long oval in outline, without the trochanter about as long as tibia; tibia about one third as wide, parallel-sided. Tarsus a little more than half as long as tibia. Tarsal digitules filiform, well knobbed at end, reaching a little farther than to the ends of claw digitules. Antennæ 6-jointed, the last three joints nearly equal in length, the sixth slightly longest, the third very long and a little wider than the following ones; the first and second about equal and each less than or about one-third as long as the third. The fourth and fifth are about one-half again as long as wide; the first is somewhat wider than length of second; the second is truncate-conical, its basal width being about equal to its length, its distal width a little more than one-half its basal.

The only other known roseate forms of *Ceroplastes* are, a variety of *floridensis*, which is easily distinguished by its much smaller size; and *aibolineatis*, which was described from Jamaica, and is a very common species in Brazil, but is at once distinguished by the two conspicuous white lines on the sides.

On branches of a wild fruit tree locally called "cojon de venado," El Cuyo del Chicosapote, near Frontera, Tabasco, June 18, 1897 (Townsend). Div. Ent., No. 7611.

***Lecanium tuberculatum*, sp. nov.**

♀. Scale very convex, rounded-oval, sometimes nearly round, normally about 4 mm. in length, 3 mm. in width, and 2 mm. in height. Color clear reddish-brown, the margin narrowly dark brown. Scale finely tuberculate and pitted near border, coarsely and less conspicuously tuberculate on rest of surface, the low rounded tubercles with shallow pits or furrows between them. In shrivelled scales the fine tuberculation is more extensive and conspicuous. Most specimens also show a pair of longitudinal dorsal impressed lines, with one or two less distinct lines running across them at right angles. No glassy secretion apparent on surface of scale. The blackish rim and tuberculate character of the scale will serve to distinguish it from *perconvexum*, which is uniformly blackish and with only the row of fine tubercles near rim.

Legs very short, tibia and tarsus equal in length and about as long as broad; the tarsus hardly narrower than tibia, rounded apically and not pointed; claw short, stout, strongly hooked, and about half the length of tarsus; femur but little longer than tibia, wider basally than apically, and as long as apical width. Digitules of tarsus and claw stout, filiform, the claw digitule apparently longer than the tarsal, which latter is about as long as the claw itself. Anal plates subtriangular, together forming nearly a square, but somewhat rounded on the caudo-lateral margin. Anal ring with four bristly hairs showing between the opened plates. Dermis chitinous, with gland pits moderately small and rather numerous. Boiling in KHO stains liquid pale brown.

Belongs to the neotropical group of *perconvexum*, *chilaspidis*, *urichi*,

imbricatum, etc., characterized by the short rudimentary legs. It comes nearest to the Brazilian *perconvexum* Ckll.

On twigs of tree called "cafetillo," San Antonio del Sapotal, near Frontera, Tabasco, June 2, 1897 (Townsend). Div. Ent., No. 7809.

***Aspidiotus jatrophae*, sp. nov.**

Belongs in the subgenus *Diaspidiotus*. ♀ scale circular to suboval, convex, pale grayish-brown, $1\frac{1}{2}$ mm. in diameter. Exuviae nipple-like, situated usually to one side of the middle, concolorous with rest of scale but of a darker shade. ♂ scale suboval or oblong, same color or a little paler than ♀, 1 mm. long and about or little more than half as wide. Scales not leaving a white surface on the bark when detached.

♀. Circumgenital glands absent. Anal orifice near posterior extremity. Three pairs of lobes. Median lobes large, oblique, very strongly notched on outer side, not at all on inner side. Well marked glandular incisions in the interlobular intervals. Chitinous processes of the glandular incisions resemble those of *A. betulae*. First interlobular interval moderately wide. Second and third lobes minute, dentiform. Spines unusually large and stout. Outer spine-like plates much branched, those of first interlobular space simple and two in number. Body of ♀ broad pyriform, yellowish brown. Species doubtless viviparous, as the ♀ is filled with large well developed embryos, and lacks the circumgenital glands.

♂ and ♀ scales massed together on bark of main stems and branches of *Jatropha* sp., called "chaya," a cultivated plant whose green juicy stems are cooked for food. Frontera, Tabasco, May, 1897 (Townsend). Div. Ent., No. 7682. This is a southern species of a northern type.

***Aspidiotus agavis*, sp. nov.**

Belongs in subgenus *Chrysomphalus*. ♀ scale circular or subcircular, brownish-gray, the marginal portion whitish. Exuviae central, black or blackish, more or less covered with a gray secretion which is usually scaled off and shows only as a border to the exuviae. Diameter, 1 to $1\frac{1}{2}$ mm.

♀. Body deep yellow. Three pairs of lobes. Median lobes widened, appearing like human incisions, contiguous to each other. Second pair of lobes about one-fifth wider than median, third pair same as second. Distance between median and second pairs of lobes less than half width of one of the median lobes. Distance between second and third pairs nearly equal to width of one of the median lobes. Spine-like plates moderately short. There is a rudimentary angular fourth lobe beyond the third pair, and the margin of the body beyond the lobes is serrate for a distance equal to that occupied by the lobes of one side, the serration being composed of smaller spine-like plates. Beyond this the margin of the body is minutely serrate. Four groups of circumgenital glands, cephalolaterals 16 in each group in one specimen; in another 13 to 16, more or less prolonged inwardly in group outline instead of rounded as normally. Caudolaterals apparently with 8 glands each.

This species is allied to *A. nigropunctatus* Ckll. It resembles it in general appearance by the blackish exuviae, and the lobes are similar in form. It may be distinguished from that species by the lobes being entire, not notched. The scales are also uniformly smaller than in *nigropunctatus*.

Massed on leaves of *Agave* sp. Toluca, Mexico, August 29, 1897 (Koebele 1697). Div. Ent., No. 7935.

***Aspidiotus koebele*, sp. nov.**

Belongs in the subgenus *Chrysomphalus*. Allied to *A. albopictus* Ckll., from which it differs as follows: Caudal end not so narrow and pointed. Caudolateral glands 3, cephalolaterals 4. Tubular glands short, only about as long as the median lobes, eight in number, the median pair having their origin posterad of the rest. In immature females these glands are much longer, and much resemble those of *albopictus*. Median lobes well separated, about as wide as long, rounded, entire. Second pair of lobes removed from the median a distance equal to diameter of either lobe, about same width as median, entire. Third pair pointed, tooth-like, somewhat farther removed from second than are latter from median, less conspicuous than other lobes. Farther down the margin a rudiment of a fourth lobe appears. Anal orifice (apparently) close up near base of tubular glands.

♀. Scale circular to suboval, flat or but little raised, $1\frac{1}{2}$ to 2 mm. in diameter, usually clear light brown but sometimes more or less grayish. Exuviae a little to one side of center, marked only by a darker ring in some specimens, in others nearly concolorous with rest of scale, while in still others they are grayish or of a lighter color. ♂ scales oblong or long-oval, usually pale grayish-brown, the exuviae usually nearer one end and light reddish-brown in color.

Numerous ♂ and ♀ scales massed on leaves of orange, Oaxaca, Oaxaca State, August 22, 1897 (Koebele 1656). Div. Ent., No. 7935.

***Aspidiotus albopictus* var. *leonis*, var. nov.**

The characters of the ♀ are the same as in *albopictus*, except that the caudolateral glands number 5 to 6, and the cephalolaterals only 6 to 7. *A. albopictus* belongs in *Chrysomphalus*. One specimen is infested by an interesting fungus.

♀. Scale circular, flat, averaging $1\frac{1}{2}$ mm. in diameter. Color of scale flesh-gray, outer border more or less distinctly whitish, the whitish often invading most of surface. Exuviae often nearly central, pale brown. Although the characters of the ♀ insect are nearly the same as in typical *albopictus*, the present specimens represent at least a good variety in the considerable differences in the characters of the ♀ scale.

On leaves of orange, Linares, Neuvo Leon, Dec. 17, 1897 (Townsend). Div. Ent., No. 7935.

***Diaspis baccharidis*, sp. nov.**

♀. Scale rather broad oyster-shell shaped, 2 to $2\frac{1}{2}$ mm. long, $1\frac{1}{2}$ to 2 mm. wide, flattened, exuviae at smaller end which corresponds to the hinge end of an oyster shell, leaving a whitish film on bark when detached. The inside or underside

of the scale is grayish in color; the outside surface is wholly covered in all cases, with a fungus of a grayish-brown color, obscuring the color of the scale so that it is impossible to distinguish it.

♂. Scale is quite distinctly tricarinate, $1\frac{1}{3}$ to $1\frac{1}{2}$ mm. long, $\frac{2}{5}$ mm. wide white; exuvium at one end, brownish-yellow or yellowish-brown. The ♂ scale is different in texture from that of the ♀.

♀. After boiling, subcircular, tinged with brownish-yellow at least anally. Three pairs of lobes, the median largest, almost imperceptibly excavated on their outer posterior border, very slightly notched on inner posterior border, about as wide as long, slightly separated, not contiguous. Second pair of lobes subround, rather less than one-half the width and length of median lobes, each removed by about its own width from median lobes, entire. Third pair of lobes small, about half the size of the second pair, appearing as tubercles on the margin, removed from second pair a distance equal to rather more than twice their diameter. Small sac-like structures situated at bases of lobes resembling in form those of *Diaspidiotus*, those of each median lobe appearing nearly U-shaped, being very indistinctly separated at base; those of third lobes shaped like a pair of heavy dots, those of second lobes transitional in form between those of median and third lobes. There are also still a fourth pair, and even a rudimentary fifth. Spines rather small and short. Spine-like plates not large, not long, equalling in length the median lobes. Anal orifice about five times its diameter removed from anal end of body, well posterior to the level of the caudolateral glands. Five groups of ventral glands, in form mulberry-shaped, especially the cephalolateral pair. Caudolaterals, about 20; cephalolaterals, about 30 or more; median group, 15.

On bark of woody stalks of *Baccharis glutinosa*, Amecameca, Mexico, June 1, 1897 (Koebele 1758). Div. Ent., No. 7959.

***Pseudoparlatoria serrulata*, sp. nov.**

Distinguished at once from the other species of the genus so far known by the minutely serrulate character of the lobes. Five groups of circumgenital glands caudolaterals 11 to 15, cephalolaterals 12 to 15, median 2. Allied to *P. noacki* Ckll., rather than to *P. parlatorioides* Comst., as indicated by the five groups of glands, the latter species having only four. The median lobes are not so pointed as in *noacki*, but are rather rounded; while not notched like *parlatorioides* (as in Comstock's figure), they are rather inconspicuously notched nearer the base. The spine-like plates of first and second interlobular spaces are shorter than in either species, projecting but little beyond the end of the lobes. Lobes of second pair divided into three lobules. Fish tail structure between the median lobes hardly projecting beyond the lobes.

♀. Scale $1\frac{1}{2}$ to 2 mm. in diameter, flattened, subcircular, whitish, grayish, or greenish gray; exuviae lateral, pale yellowish or yellowish-brown. ♂ scale small, subpyriform, about 1 mm. long, exuviae at the wider end; color grayish, with exuviae yellowish.

On leaves of unknown tree HERNOSILLO, Sonora, April 23, 1897 (Koebele 1719). Div. Ent., No. 7934.

SOME MEXICAN PHALANGIDA.

BY NATHAN BANKS.

Cynorta mexicana, sp. nov.

Length body, 6.5 mm.; breadth, 4.5 mm.; femur I, 2 mm.; femur II, 3.5 mm. Dull yellow brown, tibiæ darker, last palpal joint black. Dorsum nearly smooth, eye-tubercle low, smooth; tibia of palpus very broad, last joint ending in a fine curved claw; legs I, II and III nearly smooth, with fine hairs; venter smooth; dorsum of abdomen with low tubercles along each side to the hind femora, on hind part of middle a pair of very small tubercles, scarcely evident, and behind them a transverse row of four minute tubercles, the hind border of the shield and of the next two segments with a row of small tubercles; hind leg spinulate on femur, patella and tibia, rather more strongly on last two, on inner side of femur near tip is a larger, prominent, blunt spine. Readily known from our forms by larger size, absence of markings, small tubercles, and armature of hind leg.

Erginus mexicana, sp. nov.

Length, 3.9 mm.; femur I, 1.7 mm.; femur II, 3.1 mm. Body almost uniform pale yellowish, legs paler, nearly white. Dorsal surface evenly and rather roughly granulate, eye-tubercle broad, low; basal joint of mandibles swollen above and prominent, distinctly granulate; palpi appressed to mandibles, the femur broad, denticulate above, below on inner margin with six blunt teeth, tibia very broad, concave within, margins with bristles, tarsus slender, one half length of the tibia, ending in a long, fine, curved claw; venter and coxæ granulate; the margins of the very much retracted segments denticulate; legs slender, finely granulate, fourth pair nearly as long as second, but the fourth tarsus shorter than that of second leg.

One specimen; readily known by the blunt teeth under the femur of palpus.

Liobunum mexicanum, sp. nov.

Length body 4 mm., femur I, 11 mm., femur II, 18 mm. Dark brown above, nearly uniform, but faintly showing a chocolate brown vase-mark on basal part of abdomen; beneath wholly pale; palpi pale, brownish on base of the femora, above on patellæ, and at base and tip of the tibiæ; mandibles pale; legs brown, with scattered pale dots on basal joints, often arranged in groups, coxæ pale, trochanters brownish, extreme tip of tibiæ pale. Dorsum above quite finely and regularly granulate; eye-tubercle quite high, smooth, the eyes prominent; last joint of palpus as long as tibia and patella together, scarcely curved, each of the coxæ I, II and III terminate above next to the body in a small white spine.

Amecameca [Barrett]. The specimen has but three legs on the right side, leg II being absent and its coxa is rudimentary.

Liobunum albipalpe, sp. nov.

Length body 5 mm., femur I, 12 mm., femur II, 20 mm. Palpi white, basal joints rather yellowish, mandibles pale yellowish; cephalothorax black in center,

whitish on front and sides, and narrowly behind; abdomen black, a whitish stripe on the side of basal half and two or three of the segments behind are narrowly white on the side of the apical margin; coxæ and venter almost black, four elongate whitish spots just behind hind coxæ, the basal one much the largest; trochanters black, legs brown, pale on middle of femora, darker on patellæ. Eye-tubercle moderately prominent, faintly roughened above; patella of palpus with a distinct projection at inner end about as long as width of joint, tibia scarcely longer than patella, last joint slightly curved, fully as long as tibia plus patella; basal part of abdomen finely rugulose, also the apical portion of the apical segments; legs faintly roughened.

Readily distinguished by the white front and white spots behind coxæ.

Leptobunus spinulatus, sp. nov.

Length 11 mm., femur I, 5 mm., femur II, 9 mm. Black, mandibles pale yellowish, patella, tibia, and basal half of tarsus, of palpus yellow brown, coxæ dark yellow brown, extreme base of femora whitish, tarsi brownish. Eye-tubercle low, with a few spinules above, a group of numerous spinules on front border, all small; palpi with short stiff hair, tibia much longer than patella, tarsus longer than both together, nearly straight; coxæ with granules, and trochanters spinulate, rows of spinules on the femora, more irregular on patella and smaller on tibiæ; tibia II nearly smooth, with two false articulations, none in other tibiæ, none in anterior metatarsi; abdomen with transverse rows of minute, pale, pointed tubercles, rather few in a row.

Related to *L. grande*, but much more spinulate.

LIFE-HISTORY OF FERALIA JOCOSA.

BY OTTO SEIFERT.

This pretty species may be found in the vicinity of New York from the last days of March to the end of April, wherever hemlock trees (*Tsuga Canadensis*) grow in any number. The moths emerge from their pupæ about noon and ascend the hemlock trunks to develop their wings. Sometimes, on very cold days, they remain resting near the ground, as if paralyzed by the severity of the weather. When disturbed, they seem indifferent at first, but later suddenly dart off, usually to the higher branches of the trees. They are easily found, as their bright colors contrast with the dark bark, especially after rain; but they are never abundant and seem to prefer spending their lives high up amongst the foliage of the trees, so much resembling their own colors. I have never been able to find a pair in copulation, though I have often observed males and females on the same trunk. When taken home and

kept carefully with hemlock sprigs in large glass vessels, they remained nearly inactive and finally the females laid unfertilized eggs. It may be mentioned here that these moths can be kept alive for a comparatively long time when fed on slices of fresh apple.

The entire existence of this insect is bound and admirably adapted to the conifer on which it feeds. In April and May the mature hemlocks develop their flowers. The staminate aments are produced profusely on the younger, higher branches. The moth is only to be found on the larger trees. The impregnated female runs restlessly up and down the branchlets until it finds a twig with the budding staminate aments. These latter appear in numerous clusters and here on the adjoining leaves the moth deposits its rather large, pale honey yellow eggs. One or a few are glued to a leaf, mostly on the under side. The whole number of eggs rarely reaches 150.

The eggs hatch after 14 to 16 days. The pale greenish yellow larvæ at once attack the undeveloped anther sacks and feed on these only at this stage. They bury their heads and part of their bodies in the buds, covering themselves over with pollen grains. As soon as the anthers reach maturity; develop their tender filaments and turn light brown the young caterpillars leave them entirely and take to the new leaves which have just opened. In the successive stages they gradually abandon the growing leafy shoots, touching them only occasionally and, after the last molt, feed exclusively on the deep green perennial leaves. They often denude small twigs of their leaves and leave only the light green terminal shoots on the branches.

By the changes of color and design during growth the larvæ follow the successively acquired food habits. Very young larvæ are pale yellowish green, the color of the budding staminate aments; after this they change to bright, light green; then they obtain pale white longitudinal bands; later on they change to bright pea green with intense white stripes from the head to anal segment and a cherry red supra-stigmatal line bordering the white stigmatal stripe; at last the bands are broken into oval spots partly tinted and edged with yellow and red. Now the glossy, deep pea green, checkered caterpillar is admirably adapted to the deep green lacquered perennial leaves of the hemlock, variegated with flowers and buds. About six weeks after leaving the egg shell, the larval period is completed and the trim creature descends the tree, probably at night, digging into the ground close to the trunk and near the surface to form an almost oval, soft, but tenacious cocoon of earth and silk. In this it transforms to a brown pupa in a few days.

It might be rash to assume these seemingly adaptive changes of habits and colors in the larval state to be a protective measure. The insect, on account of its early appearance, hardly needs much protection from enemies. Birds are rather scarce at this time, especially in hemlock groves and probably would detect it in any case. Ichneumon flies and other parasitic hymenoptera are almost out of the question. A small Carabid beetle which ascends the trees at night and a rather large green hemipteron lurking often on the bark in day time probably never will infest the lofty habitat of the *Feralia* larvæ. Even the colors of the imago resembling the green and white mottled lichens on the bark are to all appearance of not much protective value, as some mutilated moths found near the trunks had apparently been killed by Carabids while resting on the bark. Probably the larva simply follows the general law of markings (Eimer, *Artbildung bei den Schmetterlingen*; *Orthogenesis*, etc.), gradually converting the primitive pattern of longitudinal stripes into spots. In this case these changes apparently coincide with the different surroundings which are conditioned by the altering food habits.

Egg.—Rather large, of the typical noctuid form; semiglobular, much flattened at base, depressed on top; pale honey yellow with faint greenish tint, extremely thin shelled and soft; closely ribbed when magnified, the ribs appear as blunt ridges with many irregular indentations, these ridges widening toward base, do not all commence from the vertex, nor do they all reach the base.

Eggs laid April 7th commenced to hatch April 21st. The young larvæ do not eat their egg shells, but making an opening side ways, they leave the delicate, colorless, transparent membrane in shape.

First stage.—Larvæ slender, almost pellucid, of a pale greenish yellow color. Skin not smooth but irregularly folded. Head rather large, sparsely hairy, mouth-parts and ocelli pale yellowish-brown. On 1st, 2d and 3d segments dorsally shield-like plates indicated, those on 2d and 3d are omitted after moulting. Eleventh segment humped slanting to anus, this hump before first moult has a raised shield-like plate covering the entire dorsal and subdorsal region. Segments, except thoracic and last, with five minute black dots each bearing a short slender hair arranged in the usual noctuid way (Dyar, *Classification of Lepidopterous Larvæ*); the three first segments have a few more delicate hairs and above cremaster a transverse bow of about 24 minute hairs. The young larvæ have during their earlier stages a looper-like gait and habits, holding with the after legs to a sprig and stretching the body

out like a stick. They are fond of spinning small networks over the leaves especially when moulting and drop on a thread when disturbed, but these customs are gradually abandoned during their moults. Before changing their skins they turn sordid olive green, moult during the night and eat their cast-off skins except the head shell.

After first moult.—The larvæ are bright yellowish green, slightly paler ventrally. Skin very transparent, contracted. Head comparatively smaller than before of very pale tan-color, mouth parts light brown, ocelli darker. First segment somewhat swollen, hump much produced. An indistinct stripe forms dorsally, more distinct from seventh to last segment, also a very pale whitish green lateral stripe.

After second moult.—They change to bright, glossy pea-green with pale bluish white dorsal, lateral and stigmatal stripes, all equidistant. The stripes run from first segments to the last, the stigmatal continued by a narrow line above cremaster. Cervical shield indicated by a slight depression and still brighter green, hump on top also more shiny.

After third moult.—The stripes turn clear, heavy white. The stigmatal one is bordered above by a cherry-red line. The larvæ vary much in deeper or lighter shade of green, from pea-green to bright olive; the red line with different individuals is more or less intense and when most prominent it is edged below with yellow and the stigmatal stripe appears cream-colored.

After fourth moult.—The ground color is still more glassy and transparent pea-green: stripes chalky, finely wrinkled. The dorsal stripe rather even, the lateral one almost uniform on the three first segments, but then widening in the middle of the segments and tapering in the incisures forms a chain of elongated spots. The stigmatal stripe is broken up into eleven irregular, half-moon shaped spots; conjoined. The humped 11th and 12th segments have only one spot, but enlarged; these spots are bordered above with cherry-red and shaded with yellow on the edges and junction. A pedal line of yellowish-white, oblong, irregular spots forms above the abdominal feet and on the tenth segment.

After fifth moult.—The larvæ attain their maturity. Full-grown they are nearly cylindrical, about 32 to 35 mm. long, width 4.5 mm. All 16 feet normally developed. Eleventh segment forming a hump slanting to cremaster. The few short delicate hairs distributed as before, but hardly perceptible. The finely granulated skin folded, especially on stigmatal area. Ground color deep, glossy pea-green, very transparent; head and legs more yellowish green; cervical shield and hump still brighter green. Dorsal and lateral stripes chalky white, finely

wrinkled, running from first segment to last. Dorsal stripe uninterrupted, on thoracic segments nearly uniform, then widening in the middle of segments and narrowing in the joints. The lateral stripe follows the same principal, but in a more complete way, being almost uniform on thoracic segments and forming a chain of spindle-shaped spots on the abdomen connected by a narrow line. The spot on the eleventh segment runs in a line to anal plate. From first to last segment a stigmal row of eleven large, half-moon shaped, cream colored spots, yellow on the edges and bordered above their full length with cherry red; on the three first segments the spots are more elongated forming almost a band, but they are disconnected; on last two segments one large spot which ends in a narrow white stripe, edged above with yellow, bordering the anal plate. A pedal line of oblong, irregular cream colored spots, one on each segment except on first and twelfth. Spots on second and third segments smaller than the others, the latter extending almost over the whole width of the segment.

The larvæ vary in the deeper or lighter shade of green, the intensity of the red color and prominence of the yellow edgings. One of about 75 full grown caterpillars had all, even the dorsal stripe, converted into oval spots.

From May 30th to June 3d all but a few sickly stragglers had gone into the ground. Some forming their cocoons on the surface, only covered by moss and dry hemlock leaves.

Cocoon.—Rather soft but durable, made of earth and silk.

Pupa.—Rather stout anteriorly, head cases slightly rounded, almost blunt; movable segments tapering much to anal joint, the latter ends in two fine hooks with which the pupa is fastened to the cocoon. Thorax and wing cases brown, the former shagreened, the latter wrinkled, antennæ cases clearly visible, but not much produced. Abdominal segments more reddish brown, finely punctured, the movable ones only so anteriorly. Length of pupa 15 mm., widest in the middle, 5 mm.

The imagines do not vary much in size. Almost all expand 34 mm. (about 50 specimens). There is more variation in ground color and the black scales in median space. The former varies from pea-green to bright olive; also appearing in all shades of cream color. The whole median space is often powdered with black scales, sometimes only partly and in a few specimens the black scales are omitted. The white and black t. a. and t. p. lines are nearly always regular and distinct. The green females seem to be in the majority, but in general the variability in either way is not confined to any sex, nor has the flying

anything to do with it since undeveloped soft winged green females, as well as cream colored ones have been found. Hind wings and vestiture not subject to noticeable variation, nor the underside of primaries and secondaries, which differs only slightly in deeper or lighter shading.

[NOTE.—This larva has occurred to me in the Adirondacks on the balsam fir. Its pattern of markings and coloration are strikingly like those of the pine-feeding Sphingidæ, doubtless in adaptation to the similar environment. H. G. Dyar.]

A NEW DIPTEROUS GENUS BELONGING TO THE THEREVIDÆ.

By D. W. COQUILLETT.

Henicomysia, gen. nov.

Antennæ slightly longer than the thorax, cylindrical, first joint two-thirds as long as the head, the second broader than long, one-fifth as long as the first, third joint of nearly an equal diameter until near the tip, almost twice as thick as the first joint and nearly four times as long, the apical portion tapering gradually to the tip which is truncated and destitute of a style; head nearly twice as broad as long, face bare; proboscis rather slender, the labella of about the same diameter as the proboscis proper, the two together slightly longer than the head; palpi slender, their apices considerably dilated; three ocelli present. Abdomen slender, fully three times as long as the thorax. Wings with two submarginal and five posterior cells, the fourth posterior and anal cells closed and short petiolate. Type, the following species:

Henicomysia hubbardii, sp. nov.

♂. Head black, front somewhat polished, at narrowest part one-third as wide as either eye, antennæ yellow, the second joint and apical portion of the third, brown; proboscis brown, the under side of the basal portion yellow; palpi brown, the apices yellow; a row of black macrochaetae extending around the upper half of the occiput. Thorax and scutellum yellow, polished, a white pruinose vitta in middle of dorsum of thorax, considerably expanded behind the suture, and a white pruinose spot on upper part of the pleura in front of the insertion of each wing; a black macrochaeta above, and another in front of, the insertion of each wing, thorax elsewhere, and the scutellum, bare. Abdomen black, polished, the extreme base yellowish, the posterior margins of the first four segments white; hypopygium nearly twice as long as the seventh, or last, abdominal segment. Wings hyaline, a brown cloud on veins at apex of second basal cell, and a brown fascia extending from the costa, a short distance before the apex of the second vein, to the base of the third posterior cell. Coxæ yellow, the posterior ones largely brown and covered with a silvery-white pruinosity;

femora yellow, the posterior ones except the extreme base and apex, brown; tibiæ yellow, the hind ones brown; tarsi brown, the first joint and basal half of the second joint of the hind ones, yellow; all femora and the front tibiæ bare, middle and hind tibiæ thinly beset with very short bristles; pulvilli rather large, empodium wanting. Halteres brownish, the apical portion of the knobs white. Length, 8 mm.

Ft. Grant, Arizona. A single specimen collected July 19, 1897, by Mr. H. G. Hubbard, after whom this interesting species is named. Type No. 4071, U. S. Nat. Museum.

LIFE-HISTORY OF THE TWO FORMS OF CERURA NIVEA.

BY RICHARD E. KUNZE, M.D.

In Professor Packard's Monograph on Bombycine Moths, this Cerurine Moth is mentioned as a varietal form of *C. cinerea*. Under date of August 14, 1897, the doctor wrote me, that "there were two pale or white forms of *cinerea* in my region, whose larvæ need to be identified." Professor Packard in his monograph states, that the white color of an example of *C. nivea*, in Mr. Palm's collection, from the Virgin river, southern Utah, is evidently the result of the action of bright sunlight, heat and dryness. The same conditions exist in the Salt River Valley. Phoenix and Yuma hold the record for highest temperature of Arizona, that of the former being 117° Fahrenheit in the shade, while that of Yuma exceeded it by two or three degrees. This information I obtained from U. S. Weather Bureau of this City, and an attaché of the same formerly stationed in Yuma. My examples of *nivea* were all collected at light in Phoenix up to the end of June, a few emerged from collected cocoons, and of those sent six to Mr. Charles Palm for determination. The reply stated, that according to the synopsis of Neumögen and Dyar, they were *Cerura nivea*, variety of *cinerea*. Since my correspondence with Professor Packard, have taken the autumn brood of this insect, from which I bred from ova to pupæ and imagines, and will now give as a result, that this moth has an undisputed right to rank as a species, and not as varietal form of *cinerea*. In its earliest larval stages the resemblance is nearer that of *cinerea* than any other Cerurine, while the last two stages more nearly resemble larvæ of *C. multiscripta*. In the East have bred from ova and collected larvæ of any number of *C. cinerea*, *multiscripta* and *borealis* and well remember the larval life of those species.

As before mentioned, there are two annual broods in this hot and arid region. The larva feeds on willow and cottonwood and I have collected cocoons early in spring from both food-plants. The examples which served for observation, were two females taken in September, 1897, in Phoenix. One of these was almost immaculate, except a small black spot between the veins of external border of primaries. The other was marked at the base and near cell of primaries with a few black patches and irregular markings. Bodies of both heavily clothed by long white hair, and at first thought I had taken a *Spilosoma*. The base of wings likewise thickly covered by a thick mass of shorter hair than on the body. The males of this species have longer hair than the females. These Arizona cerurines are much larger than the *C. cinerea* of the East. After ovipositing I sent both females, a little the worse for functions performed, to Professor Packard, and also better examples of the spring and autumn broods of both sexes. Ground color of all was snow-white.

The first female secured I placed in a paper box for ovipositing. This example regarding ornamentation, agreed more fully with figure 19 of Packard's Bombycine Moths, described as *C. cinerea* var. *nivea* or Dyar's type of *meridionalis*, ♂. On the night of Sept. 19th a few eggs were laid and some more the following evening. They were laid singly and in piles of 5 to 6 each. They were black, of a dull color, hemispherical and flat at base. Size 1.5 mm. Seven larvæ hatched Sept. 26th and eight more Sept. 27th, between the hours of 8.30 and 9.45 A. M., making time of hatching seven days.

Stage I.—Face neutral pink, pilose, the same as the rest of the body. On all the joints white hairs. Joint 2 has two lateral prothoracic horns finely spinose, of purple color. These processes connected by a dorsal ridge. Two subdorsal, purple stripes from joint 2 to 7, interrupted on joints 8 and 9, and continued from joint 10 to 12. Joint 13 has appended two anal, filamental legs or "tails." Dorsum greenish-yellow in a continuous line to penultimate joint. Dorsum of segments 7, 8 and 9, presents a diamond-shaped mark, due to absence of subdorsal purple stripes. Tails covered with spines or spinules, annulated purple and greenish-yellow. Near insertion the "tails" are purple, and of similar color at middle and terminal parts. Feet yellowish white, almost co. colorous with body. Length of larva without stemapods, 3 mm. and inclusive of these organs, 5.5 mm. The head .5 mm. in breadth, space between head and middle of body .33 mm. breadth, and between joints 6 and 7, .5 mm.

Stage II.—Observed October 3d, larva seven days old. Length of larva without stemapods, 14 mm. and inclusive of "tails," 19 mm. Width of joint 2, 2 mm., and of joints 6 and 7, 1.25 mm. Length of prothoracic horns, 1 mm., width of ridge connecting these processes, 3 mm. Face and body sparingly covered with white hair. Face and vertex speckled brown and green. Middle of face and mouth parts green.

Laterally a green stripe passing from vertex to mouth. Prothoracic horns brown, covered with greenish tubercles supporting a black spine. A greenish-yellow dorsal stripe, becoming triangular on joints 2 and 3; it becomes narrow and again widens on joints 6, 7, 8 and 9 into a diamond-shaped patch, constricted on joint 11, and finally widening on joints 12 and 13. A triangular brown patch in the middle of joint 3. A brown spot on joint 6. Joints 7 and 8 ornamented by an oval brownish spot centered green, and surrounded by a circle of minute, greenish tubercles. From the middle of joints 9 to 11, a brownish patch like a maple leaf. Across the penultimate joint a longitudinal brownish dash. Lateral parts of larva green, of the same color as leaf of cottonwood. All legs concolorous with lateral parts. Feet whitish. The green of abdominal parts a lighter tint, and last two joints almost white. Stemapods of a color approaching a purple or lilac brown, annulated with greenish-yellow. The extensive part of outer third of "tails" of darker shade. Spinose from insertion to tip.

Stage III.—Noted October 11th, larva 15 days old. Length of larva at rest 24 mm., of body from head to venter, 18 mm. and of stemapods, 8 mm. The width of joint 2, 3.5 mm. of joints 6 and 7, 3 mm. Head subquadrate, 3 mm. in length and 2.5 in breadth. Head brown, face almost oval, brown and of lighter tint at mouth parts. Ground color of face a much lighter brown covered with dark spots. Lateral parts of face tinted brown. Vertex light brown, the same color passing over dorsum joints 1 and 2. A chocolate brown triangular patch on joint 5, widening on segments 6 and 7, and narrowing on joint 8, forming the first, anterior diamond-shaped ornamentation. The same brown dorsal patch is repeated on joints 11 and 12, not quite so large. On joint 13 there is more of an elliptical brown dorsal patch, reaching to venter. A yellow border a little broader than the width of stemapod, passes like an irregular subdorsal line below the brown ornamentation. This line starts at the head and continues uninterruptedly to venter. On joints 3 and 4, this yellow line almost meets with only a trace of brown between. Lateral parts of larva green, exact counterpart of cottonwood leaf, covered by yellowish-white and lilac purple papillæ, some surmounted by hairs. A few dark brown papillæ on dorsal patches. Thoracic and abdominal legs green like lateral parts. Feet of a lighter tint. Stemapods lilac brown near venter, of lighter tint at the "flagellum," and twice annulated yellow, and spinose covered with setæ. Venter and abdominal parts of last three segments whitish. All other abdominal parts of larva concolorous with lateral surface. The spiracles light brown, edged by a tint of green and white centered. Feet quite pilose, hairs fewer in number toward spiracular line.

Stage IV.—Not observed until nearly mature. October 22d, mature larva 26 days old. Length at rest from head to venter, 30 mm., while in motion 37 mm., of stemapods 9 mm. when undisturbed, and during flagellation 10 mm. This gives entire length of 39 mm. at rest.

Length of head 3 mm. and over, width 3 mm. Width of segment 2, 5 mm., of joint 7, 6 mm., of joint 10, 5 mm. Dorsal abdominal diameter of segment 7, 7 mm. Head subquadrate or nearly so, a triangular patch on vertex. Color of head lilac brown with a brown spot each side of vertex. Face of lighter tint, lateral parts yellowish. Antennæ also yellowish. Mouth parts blackish. Dorsal ornamentation of a triangular patch, whitish within and lilac edged, on segments 2 and 3. The median dorsal surface is almost milk-white, much as in *C. multiscripta*, thus widely separating

larval differences of *nivea* and *cinerea*. The dorsal ornamentation of larva of *nivea* is bordered by a faint yellow line. Dorsal patch of joints 6, 7, 8 and 9, diamond-shaped, bluish-white on median line, edged rosy lilac when viewed in certain light and bordered yellowish. All diamond shaped patches much constricted near place of union. The patch of segments 10 and 11, also diamond shaped and in coloration like preceding. On segments 4 and 5, the yellowish border of dorsal patch is almost confluent, a trace of lilac tint between it. Joint 12, has a median lilac line which widens on joint 13, to form a smaller diamond patch reaching to venter. This dorsal patch is more lilac on median surface than the other. A brown elevated spot now marks the place of former prothoracic processes. Supra and intraspinal surface light green, spotted and speckled lilac and yellowish over entire parts, as far down as feet. These spots vary from ovoid to hemispherical. Below the yellowish border of dorsal ornamentation of posterior half of body, the green color of larva is lighter tinted, spiracles brown, white-centered. Thoracic feet yellow, laterally spotted brown and sparingly pilose. Abdominal feet pilose, clasping surface white, and just above a brown lunulate mark covered by 6-8 hairs. Abdominal surface concoloring with lateral parts. Dorsal and lateral surface smooth. Stemapods have lost the bright color of previous stage. Spinose, with setæ now very short.

Cocoon.—Color, dark drab. Shape, elliptical, very little flattened, strong, not indented by finger. Size, length, 24 mm ; width across central area, 9 mm.

On the night of October 22d, this larva only 26 days old, commenced to make its cocoon. The only one other example of this brood for five or six days tried hard to transform and failed, so that finally I made an alcoholic specimen of it for Professor Packard.

WHITE FORM OF CERURA NIVEA.

The accumulated evidence referred to under this heading should be accredited to the whitest form of an Arizona cerurine, heretofore known as a variety of *cinerea*. The example from which bred, a female as white as the driven snow, was ornamented with a minute, black spot between each vein on external margin of primaries. The antennæ showed very little black, which was confined to the branches, all elsewhere a spotless white. The insect was secured at light in this city. Confined in a small paper box, I obtained 65 ova, all laid singly, of which about fifty hatched October 8, 1897. In color and size, as well as shape, the ova were black and hemispherical like those of the previous female referred to. Of this brood about 33 reached maturity, and besides reserved two examples of every stage in alcohol for the use of Professor Packard. A full-grown larva or nearly so, by the time it arrived in Providence, R. I., was sent alive, and of which the doctor wrote me, Mr. Joutel made a beautiful figure. Of the earlier stages I

did not take notes, inasmuch as they resembled the progeny of the other cerurine referred to above.

Stage III.—Larva molted October 30th, when 22 days old. Length at rest from head to fork of tails, 14 mm. Stemapods, 8 mm. Breadth of joint 2, 5 mm. joint 7, 4 mm., joint 12, 3 mm. Width of head, 3 mm., length 3.5 mm. Vertex marked by a triangular green yoke, the point of which passes into the median line or dorsal band. Prothoracic horns now quite rudimentary. A round brown spot quite prominent each side of head, 1 mm. in diameter. A few white hairs on face. Mandibles greenish-white and tinted lilac. In centre of face a brown dot, surrounded by an oval, light brown border above mandibles. On each side of this oval two longitudinal lines of same color and length. Above the brown dot a triangular depression lilac edged, which has passing through the middle a whitish longitudinal bar.

On the anterior part of segments 6, 7 and 9, is a small, whitish triangular spot each side of median line, enclosing a purple oval which posteriorly is surrounded by three or four whitish dots. Joint 10, marked by faint dots of same color. Anterior ridge connecting rudiments of former prothoracic horns, of much lighter color than the rest of joint 2. Joint 4 has an elliptical purple patch, and joint 5, one of ovoid pattern on its dorsal surface. The purple of entire dorsal ornamentation bordered by a bright yellow line, which on anterior half of all segments is half a millimeter in width. This yellow line starts from below the insertion of former prothoracic processes, and is lost at the insertion of stemapods. Lateral surface green, dotted and mottled, with yellowish-white and purple spots. A few hairs on lateral surface. Spiracles tinted brown. Thoracic and abdominal legs a brighter green than the lateral parts of larva. Lateral surface of thoracic feet splashed redcish. Clasping surface whitish. Stemapods anteriorly tinted green, and annulated yellow from the middle to the flagellum. Lateral surface green covered by minute, purple papillæ.

Mature Larva, 35 days old, observed November 12, 1897. Length at rest including stemapods, 40 mm., when in motion 50 mm. Length from head to fork of tails, 32 mm., stemapods, 8 mm. Length of head, 3.5 mm., width, 3 mm. Width of joint, 3.6 mm., of joint 7, 7 mm., joint 11, 6 mm. Head purple, vertex green, antennæ white. A yellow spot indicates location of former prothoracic horns. The border of entire dorsal ornamentation is now milk-white from joint 2 to 13. The color of dorsum between this border is greenish white in some places and milk white in others.

The color intermediate between the whitered dorsal surface and whitish border line, has now changed to a lilac tint. Lateral surface of larva spotted and marked purple. Thoracic feet whitish, splashed purplish. Abdominal feet whitish and above clasps purplish. On the abdominal surface of segments, between joint 11 to venter, runs a longitudinal, median purple line. A few white hairs below spiracular line. Spiracles brown with a longitudinal, yellowish dash, ringed greenish-yellow. Anterior part of stemapods concolorous with body, and posterior part of these anal filamental organs is yellow. Entire surface of stemapods studded purple. When prolonged the extensive part of outer third of "tails," bright purple annulated lavender. Under a strong lens the purple spinules covering the stemapods, were seen to support a hair.

Cocoon.—In all thirty-eight cocoons were observed. Of these 37 be-

longed to one brood and 1 to another, all but two larvæ of the last died, affected by a fungus which previously existed in the breeding cage. As soon as larvæ commenced cocooning and had the cells well walled the branches were removed into an envelope box, where the transformation could go on undisturbedly, and permit cocoon to harden. The larvæ gnawed off bits of epidermis from the cotton wood, and mixed with saliva, formed when hardened the silken frame for the wall of its cell. It would continue building on the inside of cocoon until of sufficient strength. On the external surface the cocoon resembled the light gray bark of cottonwood, sometimes of very light tint and again of darker color to agree with surrounding conditions. The dark color of cocoon often corresponded with that of the bark deprived of epidermis. Some were darkest at the terminal ends, of a chestnut tint, especially if spun against the surface of the branch covered by an eschar, always of darker shade. Some cocoons on surface exhibited striæ, such as seen on young branches, here and there speckled, or raised bits of bark to mimicry and deceive enemies. In the open I have observed such cocoons on small canes of willow, as well as on the roughest bark of great cottonwoods, from which they had to be chiseled out with difficulty. All such yielded similar imagines as those bred. The inside of cocoon presented a smooth surface, and a concavity existed in the stem where bark was bitten off to receive one-half or one-third of the pupa. The sides of cocoon generally flattened, plainly showing silken threads, where attached to bark.

The cocoon is elliptical, mostly rounded, a very few flattened, tapering at end like a wedge. One or two cocoons seemed to be more ovoid than elliptical in shape. The measurement of another cocoon taken from a second observation jar is as follows: Length, 33 mm., width, 11 mm.; and height at central area, 6.5 mm. Another smaller cocoon gave length, 25 mm.; width, 9.5 mm.; and height, 5.5 mm.

All larvæ of this brood spun their cocoons between November 8th and 17th.

Pupa.—Cylindrical, tapering mostly at inferior extremity, where much rounded. Toward the head much less reduced in size. The flattened parts of pupa restricted to upper two-fifths, and on abdominal surface extending almost to the end of wing cases. Head and antennæ case prominent, and that of wings much more on dorsal surface. Abdominal segments on dorsal surface thickly covered with fine, dark points, as viewed through a lens. Length, 21 mm., breadth, 7 mm. at the middle part, and 6.5 mm. across thorax. Color of dorsum almost chestnut of lighter tint toward anal segment. A longitudinal, dorsal black line from the thorax to penultimate, abdominal joint. Color of case covering palpi, antennæ and wings, show

traces of a greenish tint as far down as costa of primaries. Abdominal segments a shiny, light brown almost chestnut. Posterior edge of three anterior segments heavily banded by darker brown, which is absent on the last two. A slight depression of the case on either side of thorax, between the wings and first adominal segment.

Of twenty-four imagines emerged, I have the following record : April 14, 1898, one ♂ emerged from only cocoon of the first brood the parent representing the ordinary form of *C. nivea*. The emerged moth agreeing quite in every particular with this form. On same date emerged three ♂ of the second brood, bred from an almost immediate female. The progeny all took after the ordinary form of *nivea* as well as twenty others, which emerged in the following order : April 15th, 2 ♀ ; April 18th, 2 ♂ and 1 ♀ ; April 20th, 1 ♀ and 1 ♂ ; April 21st, 1 ♀ ; April 22d, 2 ♀ and 1 ♂ ; April 23d, 2 ♂ ; April 24th, 2 ♀ ; April 25th, 3 ♂ ; April 26th, 1 ♀ ; May 1st, 1 ♂ .

Six cocoons of the second brood I sent to Prof. Packard, and have not heard of result. Several went over to emerge in autumn, provided these do not perish.

Imago.—The pectination of antennæ of the male, black. Entire body heavily clothed with long white hair. Head white, across the occiput a few black hairs ; on the dorsal part of thorax a transverse mark of black hairs, usually fringed posteriorly with yellow hairs. Abdomen white, forewings white, with a few yellow hairs near base of wing. A triangular, black mark across the middle of the cell. A row of black spots between the veins of external border. A similar row of black spots, across the wing near the end of cell. A few minute black spots near base of wing, between cell and inferior border. A few triangular black spots on costa. Hind-wings immaculate. Reverse side of wings immaculate. Antennæ of female simple, black. In other respects, the head, thorax, abdomen and wings are ornamented the same as in the male. Legs white, feet blackish in both sexes. Sometimes the intravenular spots are reproduced on reverse side of wings, and a black spot is noticeable in the cell of inferiors. In the whitest form of *nivea*, black spots occur only between the veins of the forewings close to the fringe of the external border.

Food-plants.—*Populus balsamifera*, var. *candicans*, one of the Western Cottonwoods, and *Salix* spec., a narrow-leaved willow. One larva near Flagstaff, found on *Populus tremuloides*, much resembling species herein described.

Habits.—The young larva feeds on the tender parenchyma of upper side of leaf, thus exposing the skeleton of the blade. It spins a web, to which it clings. When five days old the larva feeds on the green pulp as well as fibrous part of the leaf, except midrib. It was supposed by some that the anal filamental organs or "tails," were for the purpose of aiding in casting aside dung pellets. This is not the case. As stated in a preceding paragraph, I noticed larva less than

three hours old, remove a pellet wedged in tightly between the fork of stemapods, and toss it far away with its mouth parts. In so doing it moved the extensile part of "tails" vigorously up and down. Whenever a larva large or small had to be removed from breeding cage for purposes of noting changes, the stemapods always moved to and fro in a very lively manner. It appears that it might be to frighten enemies. Whenever a larva, while in process of making cocoon, was disturbed, especially before completely housed in it, would endeavor to spin it elsewhere. Even the change from perpendicular of breeding jar to that of horizontal final depository, would cause it to make the attempt. One larva left its cocoon and transformed into pupa in an envelope box.

General Observation.—The first molt of larva occurred in from 7 to $7\frac{1}{2}$ days. Second molt in 15 days. Third molt in 21 days and over. Warm temperature, and moisture seems to facilitate some of the stages. Cool weather much retards the time between stage IV, and pupating. One larva commenced to make its cocoon when only twenty-six days old, and others when from four to five weeks old. After ceasing to feed, the larva rests a day or longer and contracts in size before the last transformation takes place. A week after second molt the color of the dorsal band or diamond patches, changes from chocolate brown to lilac brown, which in certain lights varies from amethystine to purplish tints. Two annual broods occur in Arizona, the pupa of autumn brood hibernating.

PRELIMINARY LIST OF THE DRAGONFLIES OF STATEN ISLAND, WITH NOTES AND DATES OF CAPTURE.

BY WM. T. DAVIS.

There are no large, clear ponds on Staten Island like Echo Lake and Green Pond in northern New Jersey, and consequently the dragonflies that make such bodies of water their home, are not to be found on the Island. The sub-family Libellulinae, however, seems to be well represented and all but two of the species mentioned by Mr. Philip P. Calvert in his Catalogue of the Dragonflies of the Vicinity of Philadelphia, page 267, are here recorded.

Thanks are due to Mr. Calvert for identifying species, or passing upon identifications already made, and at his suggestion I have indicated, by placing an asterisk before their names, the seven dragonflies which are additions to the list of "The Odonata of New York

State," published in this JOURNAL, Vol. III, pp. 39-48 and Vol. V, pp. 91-95.

Subfamily CALOPTERYGINÆ.

Calopteryx maculata *Beauv.* Common along the banks of brooks in July and August.

Subfamily AGRIONINÆ.

Lestes congener *Hagen.* September.

Lestes unguiculata *Hagen.* On July 15, 1894, several females were ovipositing in the stems of grasses growing on the edge of one of the Four Corners iron mine ponds.

Lestes forcipata *Rambur.* May, June, August.

Lestes rectangularis *Say.* June, July, August.

***Lestes inequalis** *Walsh.* July.

Argia violacea *Hagen.* July, August.

***Argia apicalis** *Say.*

***Nehalennia posita** *Hagen.* June, July, August.

Amphiagrion saucium *Burmeister.* June, August.

Enallagma civile *Hagen.* June, August, September.

Enallagma aspersum *Hagen.* June, July, August.

Enallagma signatum *Hagen.* June, August.

Ischnura verticalis *Say.* May, June, July, August.

Ischnura ramburii *Selys.* September, October.

Anomalagrion hastatum *Say.* July, September.

Subfamily GOMPHINÆ.

Gomphus exilis *Selys.* May, June, July.

Gomphus villosipes *Selys.* June.

***Cordulegaster maculatus** *Selys.* Richmond. May 30, 1890.

Subfamily ÆSCHNINÆ.

Epiæschna heros *Fabricius.* May, June, July, August. On the 7th of June, 1885, at 8.35 P. M., one of these insects flew into my open window. There was a light in the room at the time. The female has been observed on the 28th of July laying eggs in dead, water-soaked branches lying in swampy pools in the woods.

Boyeria vinosa *Say.* July (September. N. J.)

Basiæschna janata *Say.* One male. May 2d.

Æschna juncea *L.* var. **verticalis** *Hagen.* June, September, October. On the 21st of October, 1882, in the Clove Valley, one of

these dragon flies was seen to crawl down a stick lying in the water until it was entirely below the surface of the pool, as recorded in *Entomologica Americana*, Vol. I, p. 18.

***Æschna constricta* Say.** June, September, October. On August 26, 1894, about six P. M., several hundred dragon flies were seen flying westward over Slosson's Lane, West New Brighton. They were a species of *Æschna* as I could see with my glass, but none flew low enough to permit of capture.

***Anax junius* Drury.** April 9, 1893, plentiful at Watchogue. May, June, July, August and September. In copula May 5.

* ***Anax longipes* Hagen.** Clove Valley, June 5, 1881; August, 9, 1885. Also at Orange, N. J.

Subfamily CORDULINÆ.

***Tetragoneuria cynosura* Say.** May, June, July.

Subfamily LIBELLULINÆ.

* ***Pantala flavescens* Fabricius.** July, August, September. July 30, 1887, at New Brighton. On July 31, 1887, there were many specimens near the reservoir of the Crystal Water Company at Four Corners, nearly all of them keeping over a field of oats. They were quite difficult to capture, except those newly emerged from the pupæ, and all that were seen closely were males.

***Tramea carolina* Linné.** May, June, July, August, September. On July 15, 1894, a male *Tramea carolina* was flying over one of the Four Corners iron mine ponds. Soon a female came and commenced dipping her abdomen into the water. In a moment she was seized by the male and they flew away. In a half hour they were back and went flying about together, the male now and then suddenly letting go his hold and with equal rapidity catching the female again by the neck. Other male dragonflies flew after them and when the female stopped to lay eggs, they annoyed her considerably. The chief among the disturbers was a *Libellula basalis*. After a time the male *Tramea* left his mate and she was quickly seized by the aforesaid *Libellula basalis*, after which they flew about together for a considerable time. After letting go his hold once and flying down the pond, the *L. basalis* returned and seized the *Tramea* a second time.

***Tramea lacerata* Hagen.** May, June, July, August, September. Often quite abundant on the salt meadows.

***Libellula basalis* Say.** June, July.

***Libellula auripennis* Burmeister.** May, June, July.

Libellula cyanea *Fabricius*. June, July, August.

Libellula exillena *Westwood*, form **vibrans** (*Fabricius*?) Kirby. Not uncommon on the Island in August, 1894; much less common in July, 1895.

Libellula exillena *Westwood*, form* **incesta** *Hagen*. July, August.

Libellula quadrimaculata *Linné*. Arlington, May 11, 1889, and plentiful June 19, 1893.

Libellula semifasciata *Burmeister*, April 25, 1896. May, June, July, August, September.

Libellula pulchella *Drury*. May, June, July, August, September.

Plathemis trimaculata *De Geer*. May, June, July, August, September.

Micrathyria berenice *Drury*. May, June, July, August. Often of a quiet summer evening countless numbers of this species will be seen settled on the grass stems in the salt meadows, in which position they spend the night. When they are particularly abundant the July crop of mosquitoes is speedily reduced in numbers, being devoured at headquarters.

Nannothemis bella *Uhler*. June and July, 1888, at the Four Corners iron mine ponds.

Celithemis elisa *Hagen*. June, July, August.

Celithemis eponina *Drury*. May, July.

Leucorhinia intacta *Hagen*. May, June.

Diplax rubicundula *Say*. July, August, September.

Diplax obtrusa *Hagen*. July.

Diplax semicincta *Say*. July 15, 1894. Four Corners iron mine ponds.

Diplax vicina *Hagen*. September, October, November. While my companion and I were sitting in the sun on October 21, 1892, five of these dragonflies at one time lit upon us, wishing to sun themselves also. Some lit on my hands—one on the end of my thumb. The dragonflies are most attracted if you have on light colored garments, or a newspaper spread on the ground is a favorite resting place.

Diplax corrupta *Hagen*. Shore at Eltingville, May 27, 1896. (See this JOURNAL, Vol. V, p. 95.)

Perithemis domitia *Drury*. June, July.

Mesothemis simplicicollis *Say*. June, July, August.

Pachydiplax longipennis *Burmeister*. June, July, August, September.

NOTE ON THE NEST OF VESPA CRABRO.

PLATES IX AND X.

By WILLIAM BEUTENMULLER.

The nest of this species, figured on Plate X, was found by Dr. E. G. Love, at Jamaica, Long Island. It was built in a hollow oak tree, and only had a small opening which was used as an entrance for the wasps. The figure is very much reduced; the nest is about two feet long and seven inches wide. The comb figured on Plate X is natural size and was taken from the middle part of the nest. In the American Museum of Natural History is a nest of *Crabro* from Germany, which is oblong oval, and constructed of a brittle, light brown wood pulp, from pine. It is an external nest, being covered with "paper" from which the resin exuded, giving it a variegated appearance. It evidently had been built between the rafters of a house. The top of nest is open, and shows traces of having been fastened at that end.

PROCEEDINGS OF THE NEW YORK ENTOMOLOGICAL SOCIETY.

MEETING OF NOVEMBER 2, 1897.

Held at the American Museum of Natural History.

President Palm in the chair. Fifteen members present.

Mr. C. F. Hartman was elected an active member.

Mr. Davis exhibited a pupa, pinned soon after the pupation, that had continued to develop, and the butterfly had emerged with the pin stuck through it. He stated that he had experimented with several species with the same result.

Mr. Doll exhibited several cases of rare North American Lepidoptera, and after a general discussion the meeting adjourned.

MEETING OF NOVEMBER 16, 1897.

Held at the residence of Mr. Miller, 141 East 40th Street.

The entire evening was devoted to an auction sale of insects for the benefit of the JOURNAL, and the sum of \$117.00 was realized.

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Dr. Martin read a paper entitled "On Collecting in New York City Forty Years Ago." He stated that he began collecting insects in Albany, and then came to this city and collected for about ten years. He collected principally in Washington Square, which in the fifties was a very different place from the Washington Square of to-day. The trees were mostly poplar, buttonwood, locust and weeping willow. He gave a graphic description of the features, and also mentioned the following as some of the insects caught there: Two species of *Catocala*, *Vanessa antiopa*, *Grapta comma* and *interrogationis*, *Limenitis dissippus*, a *Sesia*, much like *apiformis*, in the roots of poplar, *Brontes dubius*, *Saperda calcarata*, *Parandra brunnea*, *Dorcus parallelus*, *Pterostichus lucublandus*, *Neoclytus erythrocephalus*, *Caloides nobilis*, *Elaphrus ruscarius*, *Cotalpa lanigera*, several species of *Lachnosterna*, *Staphylinus*, *Chlænium*, *Harpalus* and also many *Hymenoptera* and *Diptera*. He stated that the black species of *Ophion* and *Pelecinus polycerator* were very common. Several species of *Agapostemon* on Althea flowers were also abundant. The canker-worms at that time swarmed over everything, but after the introduction of the English sparrow they gradually disappeared. *Calosoma scrutator*, *C. calidum* and *C. externum* were abundant and fed on the canker-worms. *Rhagium lineatum* was also to be found. He further stated that during that time *Oxacis dorsalis* was to be found at Sandy Hook under logs and pieces of wood.

Mr. Beutenmuller said that this insect was yet to be found at Sandy Hook near the old steamboat landing, and he also exhibited larvæ of *Eudæmonia argus* and *argiphontes*.

Mr. Southwick made a few remarks on his work in Central Park, and said that with a little more help at certain seasons of the year he could manage to get rid of the *Orygia leucostigma*.

Mr. Doll exhibited a fine series of *Schinia brevis* caught near Brooklyn. He also showed some striking varieties of *Vanessa antiopa* lacking the blue spots.

After discussion, adjournment.

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No. 4.

A CONTRIBUTION TO THE STUDY OF THE FAUNA OF THE GRAVE. A STUDY OF ON HUN- DRED AND FIFTY DISINTERMENTS, WITH SOME ADDITIONAL EXPER- IMENTAL OBSERVATIONS.

BY MURRAY GALT MOTTER, B.S., M.A., M.D.

Volunteer in the United States Bureau of Animal Industry.

It were fitting, at the very outset of this report, to make acknowledgment of the kindly interest and assistance, through which alone the work was made possible: To Dr. Ch. Wardell Styles, Zoölogist of the Bureau of Animal Industry, U. S. Department of Agriculture, for the facilities of his laboratory; to the Entomologist, Dr. L. O. Howard, and his assistants, Messrs. Schwarz, Coquillett, Pergande, Banks, and Chittenden, and to Messrs. Simpson and Benedict, of the Smithsonian Institution, who, by their specific determinations and valued suggestions, have brought order out of the chaos of an amateur collector.

At the suggestion of Dr. Stiles, the work was undertaken to determine, if possible, the bearings of Mégnin's "Application of Entomology to Legal Medicine," in so far as they might be learned through a faunistic study of such disinterments as we should have access to, in and about the City of Washington. The collection and superficial differentiation of specimens were made by the writer, for the most part without assistance, it being found better to have all the observations made by the same individual. While, by this plan, less was accomplished in the way of collecting, what was done was done more thoroughly and uniformly. It is to be regretted that, owing to these circumstances, it was impossible to take fuller, more detailed notes of the general conditions observed in each disinterment.

This phase of the subject, the appearance and condition of the human cadaver, after varying periods of interment and under varying conditions, has received more or less scientific study for something over a hundred years at least. Beginning with the report, published in 1783, of the exhumations at Dunkerque, and continuing with Thouret's report of those by Fourcroy in 1789; Marc's article in the Dictionary of the Medical Sciences for 1815; the studies of Orfila and his associates, and the more recent studies of Bordas—throughout all, the difficulties and complications of the subject are seen to be such that, from the condition of the cadaver alone, no certain knowledge of the exact date of death is to be had.

Some of the conditions which influence and determine the process and progress of the decomposition of buried human cadavers would seem to be as follows: The age, sex, and perhaps even the race of the subject; the character and duration of the disease process to which he succumbed; the mode of death, whether quiet and peaceful or violent and painful; the season of the year at which this event occurs; the temperature and general conditions of the sick-room; the length of time intervening between death and burial; the attention given the corpse in the matter of cleaning, embalming and clothing; the kind of coffin in which it is placed, its internal fittings and external casings; the grave, its depth, the way it is prepared and filled, whether one or more interments be made in the same grave-site; the soil, its character physical and chemic, soil-temperature and soil-moisture; the general, physical, climatic and meteorologic conditions of the cemetery in which interment is made.

These are but some of the many factors which must be taken into consideration in the study of exhumed human cadavers. Just what weight should be given to each we seem, at present, utterly unable to determine. As in the study of the living, but diseased, subject, each case would seem to be a law unto itself; and our previous knowledge of apparently similar cases can afford suggestions only, not hard and fast rules. To illustrate, Barrett quotes from Orfila an exhumation, at Valenciennes, after fifteen years' interment, where "preservation was so perfect the inspectors were enabled to determine that the individual had not died a violent death, but of a peripneumony, complicated with a gastro-enteritis." In the following list will be found two cases (Nos. 7 and 8), in which, after but three years and six months, the skeletons were completely stripped and all soft tissues gone. Again,

Orfila, Goedart and others have been led to the conclusion that, other things being equal, the deeper the grave the slower the progress of decomposition. In two cases following (Nos. 58 and 59), buried within sixteen days of each other, after an interment of seven years and nine months, the skeleton at the bottom of the grave was found almost wholly stripped, while the upper one had still a heavy case of adipocere.

So varied and so numerous are the modifying conditions and circumstances that it is impossible to say, definitely and absolutely, what is the exact order of disappearance of the several organs and tissues. Looking at the problem from the opposite standpoint, it seems that the bones and the hair are the last to undergo disintegration. I have found the bones, after an interment of seventy-one years, still preserving their general form and appearance, though easily crushed between thumb and fingers; the hair I have seen practically intact after thirty-six years. The brain I have found a still recognizable grayish mass, lying within the skull after all the other soft tissues had disappeared and the skeleton had been completely disarticulated. Indeed, I have found it, after eighteen years and two months (No. 136), lying on the occipital bone after the skull itself had fallen apart. Strange to say, the spinal cord seems to disappear much earlier; I have failed to find any vestige of it—in one case (No. 6)—after three years and five months. The skin and the more superficial connective tissues of the trunk and extremities are converted into a sort of case of adipocere, which preserves the general outline of the cadaver long after the internal organs, and the muscles and tendons even have been completely destroyed and the skeleton within stripped and disarticulated. Under ordinary conditions of interment, some, at least, of this adipocere may persist for ten or twelve years, remaining longest about the pelvis and lower part of the abdomen. I have been able to recognize the skin, fasciæ, muscles, tendons, vessels and nerves of the thigh in one cadaver (No. 44) after six years and five months; while, on the other hand, in another case (No. 40) the muscles had entirely disappeared after six years and three months. In most of the cases observed, the thoracic and abdominal organs seem to have disappeared before the muscles. The face, hands and feet seem to be the first parts attacked; I recall at least one instance where the skull was entirely stripped while as yet there seemed to be but little change elsewhere.

In the following pages I have brought together, for the purpose of

a closer study and comparison, the notes of one hundred and fifty disinterments, made within the city limits of Washington, D. C., during the summers of 1896-97. The cases are arranged chronologically according to the period of interment of each, and the fauna is grouped systematically. The specimens will be deposited in the U. S. National Museum, at Washington, as the Stiles-Motter Collection of cadaveric fauna.

1.—1 yr. 11 mos. Grave 6 ft., moist; sandy. Erysipelas. Interred May 3, 1894.

Pseudoscorpiones, *Chelanops tristis* Bks., 14 specimens.

Thysanura, undetermined.

Coleoptera, Staphylinidæ, *Atheta*, sp. (*Homalota* ?), 1 specimen.

“ “ *Eleusis pallida* Lec., 2 specimens.

“ Nitidulidæ, *Rhizophagus sculpturatus* Mann., 2 specimens.

2.—2 yrs. 10 mos. Grave 6 ft., coffin submerged; sand and clay. Interred July 14, 1894.

Thysanura, undetermined.

Diptera, Muscidæ, *Lucilia cæsar* Linn., puparia.

“ Anthomyidæ, *Homalomyia*, sp.

3.—3 yrs. 1 mo. Grave 5 ft., wet; sand and clay. Hepatic abscess. Interred March 12, 1893.

Crustacea, *Armadillidium vulgare* Latr., 1 specimen.

Thysanura, undetermined.

Homoptera, Coccidæ, *Ripersia*, sp., in Phorid puparia.

Diptera, Phoridæ, puparia.

4.—3 yrs. 2 mos. Grave 6 ft., coffin submerged; sand and clay. Interred February 15, 1894.

Vermes, Lumbricid, undetermined.

Acarina, Gamasidæ, *Tyroglyphus*, sp.

Coleoptera, Staphylinidæ, *Actobius pæderoides* Lec., fragment.

“ “ *Pederus littorarius* Grav., 3 specimens, two covered with undetermined fungus.

“ “ *Eleusis pallida* Lec., 160 specimens.

“ Elateridæ, *Monocrepidius bellus* Say, 1 specimen.

Diptera, Stratiomyidæ, larva.

“ Phoridæ, puparia.

“ Sepsidæ, *Piophilæ casei* Linn., puparia.

“ Borboridæ, wings (*Limosina* ?).

5.—3 yrs. 3 mos. Grave 3 ft., dry; sandy. (Infant.) Congestion of lungs. Interred February 21, 1893.

Diptera, Phoridæ, puparia.

6.—3 yrs. 5 mos. Grave 5 ft., coffin submerged; sand and clay. Interred January 18, 1894.

Diptera, Muscidæ, *Comptosia macellaria* Fabr., puparia.

Only a few of these puparia found. Thoracic and abdominal organs, neck and soft tissues of face and hands destroyed. Abdominal and chest walls almost intact. Ribs not yet disarticulated. Spinal cord gone.

- 7.—3 yrs. 6 mos. Grave 5 ft., moist; sand and clay. Pneumonia. Interred December 29, 1893.
 Acarina, Gamasidæ, *Uropoda depressa* Bks., sp. n.
 Thysanura, undetermined.
 Coleoptera, Staphylinidæ, *Eleusis pallida* Lec., numerous.
 Diptera, Phoridæ, puparia.
 Mites, thysanura and beetles working together in slimy debris about thighs and pelvis. All soft tissues gone; some clothing still remaining.
- 8.—3 yrs. 6 mos. Grave 5 ft., moist; sand and clay. Bronchitis. Interred December 17, 1893.
 Acarina, Gamasidæ, *Uropoda depressa* Bks., sp. n.
 Thysanura, undetermined.
 Coleoptera, Staphylinidæ, *Eleusis pallida* Lec., fragments.
 Diptera, Phoridæ, puparia.
 All soft tissues gone; some clothing still left.
- 9.—3 yrs. 6 mos. Grave 5 ft., moist; sand and clay. Phthisis. Interred December 10, 1893.
 Araneida, *Theridion subterranea* Bks., sp. n.
 Acarina, Gamasidæ, *Uropoda depressa* Bks., sp. n.
 Thysanura, undetermined.
 Coleoptera, Staphylinidæ, *Actobius umbripennis* Lec., 2 specimens.
 “ “ *Eleusis pallida* Lec., numerous.
 Diptera, Sepsidæ, *Piophilæ casei* Linn., puparia.
 Thysanura, beetles and larvæ working in layers of adipocere, lower abdominal wall and pelvis.
- 10.—3 yrs. 6 mo. Grave 5 ft., moist; sand and clay. Phthisis. Interred November 20, 1893.
 Acarina, Gamasidæ, *Uropoda depressa* Bks., sp. n.
 Thysanura, undetermined.
 Coleoptera, Staphylinidæ, *Eleusis pallida* Lec., numerous, adults and larvæ.
 Beetles and larvæ especially about pelvis.
- 11.—4 yrs. 1 mo. Grave 5 ft., moist; sand and clay. Phthisis. Interred June 13, 1893.
 Acarina, Gamasidæ, *Uropoda depressa* Bks., sp. n.
 Coleoptera, Staphylinidæ, *Actobius umbripennis* Lec., larva.
 “ “ *Eleusis pallida* Lec., 6 specimens.
 Diptera, Muscidæ, *Lucilia cæsar* Linn., puparia in great numbers.
 “ Sepsidæ, *Piophilæ casei* Linn.
 Skeleton completely stripped and disarticulated. Mites on bones. Beetles and larvæ from slime in bottom of coffin.
- 12.—4 yrs. 1 mo. Grave 5 ft., moist; sand and clay. Uræmia. Interred June 6, 1893.
 Acarina, Gamasidæ, *Uropoda depressa* Bks., sp. n.
 Coleoptera, Staphylinidæ, *Eleusis pallida* Lec., adult and fragments.
- 13.—4 yrs. 1 mo. Grave 5 ft., moist; sand and clay. Dropsy (!). Interred May 25, 1893.
 Araneida, *Erigone albescens* Bks., sp. n.

- Acarina, Gamasidæ, *Uropoda depressa* Bks., sp. n.
 Diptera, Phoridæ, puparia.
 Hymenoptera, Myrmicidæ, *Monomorium minutum* Mayer.
- 14.—4 yrs. 1 mo. Grave 3 ft., dry, sandy. Phthisis. Interred May 24, 1893.
 Acarina, Gamasidæ, *Uropoda depressa* Bks., sp. n.
 Thysanura, undetermined.
 Diptera, Phoridæ, puparia.
 “ Muscidæ, *Lucilia cæsar* Linn., puparia.
 “ Sepsidæ, *Piophilæ casei* Linn., wing.
 No coffin, only burial case used. Myriads of mites, thysanura and puparia.
 No beetles nor larvæ. Skeleton stripped.
- 15.—4 yrs. 1 mo. Grave 5 ft., moist; sand and clay. Bronchitis. Interred May 18, 1893.
 Acarina, Gamasidæ, *Uropoda depressa* Bks., sp. n.
 Thysanura, undetermined.
 Pseudoneuroptera, *Termes flavipes* Kollar.
 Coleoptera, Staphylinidæ, *Eleusis pallida* Lec., fragments.
 “ Larvæ, undetermined.
 Diptera, Phoridæ, puparia.
 One live staphylinid escaped (*Actobius*?). Skeleton stripped and dry.
- 16.—4 yrs. 2 mos. Grave 5 ft., moist; sand and clay. Senility. Interred May 7, 1893.
 Acarina, Gamasidæ, *Uropoda depressa* Bks., sp. n.
 Coleoptera, Staphylinidæ, *Actobius umbripennis* Lec., 1 and larva.
 “ “ *Lathrobium simile* Lec., 1 specimen.
 Diptera, Phoridæ, puparia.
 Few insects found. Skeleton completely stripped. Some clothing still remaining.
- 17.—4 yrs. 2 mos. Grave 5 ft., moist; sand and clay. Nephritis. Interred May 8, 1893.
 Acarina, Gamasidæ, *Uropoda depressa* Bks., sp. n.
 Coleoptera, Staphylinidæ, *Actobius umbripennis* Lec., 1 and larvæ.
 “ “ *Eleusis pallida* Lec., numerous.
 “ Larvæ, undetermined.
 Beetles and larvæ especially about pelvis; elsewhere all soft tissues gone.
- 18.—4 yrs. 3 mos. Grave 5 ft., moist; sand and clay. Valvular disease of heart. Interred May 14, 1893.
 Acarina, Gamasidæ, *Uropoda depressa* Bks., sp. n.
 Thysanura, undetermined.
 Coleoptera, Staphylinidæ, *Actobius umbripennis* Lec., 1 specimen.
 “ “ *Eleusis pallida* Lec., numerous.
 “ Larvæ, undetermined.
 Fairly alive with mites, thysanura, beetles and larvæ, working on surface of cadaver, under clothing. Cadaver large and heavy; general outlines still well preserved by case of adipocere.
- 19.—4 yrs. 4 mos. Grave 5 ft., moist; sand and clay. Interred March 28, 1893.
 Acarina, Gamasidæ, *Uropoda depressa* Bks., sp. n.

Coleoptera, Staphylinidæ, *Eleusis pallida* Lec., numerous.

" Larvæ, undetermined.

- 20.—4 yrs. 5 mos. Grave 4 ft., moist; sand and clay. Interred January 24, 1893.
Thysanura, undetermined.

Coleoptera, Staphylinidæ, *Actobius umbripennis* Lec., 1 specimen.

" " *Lathrobium*, sp., head of larva.

" Larvæ, undetermined.

Diptera, Sepsidæ, *Piophilæ casei* Linn., puparia.

A number of very minute, silvery thysanura, so active that it was almost impossible to take them.

- 21.—4 yrs. 10 mos. Grave 4 ft., moist; sand and clay. (Infant.) Diarrhoea. Interred September 6, 1892.

Coleoptera, Staphylinidæ, *Actobius umbripennis* Lec., 1 specimen.

" " *Eleusis pallida* Lec., 7 specimens.

" Larvæ, undetermined.

Coffin filled with mud and slime.

- 22.—4 yrs. 11 mos. Grave 3 ft., moist; sand and clay. Cholera infantum. Interred August 9, 1892.

Coleoptera, larvæ, undetermined.

Bones almost disintegrated. Specimens from wood of bottom of coffin.

- 23.—5 yrs. Grave 6 ft., wet loose clay. Rheumatism. Interred April 17, 1891.
Thysanura, *Isotoma*, sp.

Coleoptera, Curculionidæ, larva (*Sphenophorus*?).

- 24.—5 yrs. Grave 5 ft., coffin submerged; sand and clay. Typhoid. Interred May 13, 1891.

Thysanura, undetermined.

Coleoptera, Staphylinidæ, *Eleusis pallida* Lec.

- 25.—5 yrs. Grave 6 ft., wet, sandy. Phthisis. Interred April 23, 1891.

Thysanura, undetermined.

- 26.—5 yrs. 3 mos. Grave 5 ft., wet; sand and clay. Interred April 5, 1892.

Thysanura, undetermined.

Coleoptera, Staphylinidæ, *Eleusis pallida* Lec., 8 specimens.

- 27.—5 yrs. 3 mos. Grave 5 ft., moist; sand and clay. Congestion of brain. Interred March 22, 1892.

Coleoptera, Staphylinidæ, *Actobius umbripennis* Lec., 1 specimen.

" " *Eleusis pallida* Lec., numerous.

" Larvæ, undetermined.

Considerable adipocere on legs and pelvis.

- 28.—5 yrs. 3 mos. Grave 5 ft., coffin submerged; sand and clay. Interred March 10, 1892.

Acarina, Gamasidæ, *Uropoda depressa* Bks., sp. n.

Coleoptera, Staphylinidæ, *Eleusis pallida* Lec., numerous.

- 29.—5 yrs. 4 mos. Grave 5 ft., wet; sand and clay. Typhoid. Interred March 9, 1892.

Acarina, Gamasidæ, *Uropoda depressa* Bks., sp. n.

Coleoptera, Staphylinidæ, *Homalota*, sp., 5 specimens.

" " *Actobius umbripennis* Lec., fragments.

Coleoptera, Staphylinidæ, *Eleusis pallida* Lec., numerous and fragments.

" Larvæ, undetermined.

Beetles found working in layers of adipocere and within the bones.

- 30.—5 yrs. 4 mos. Grave 5 ft., coffin submerged; sand and clay. Cardiac dropsy. Interred February 2, 1892.

Thysanura, undetermined.

Nothing left but the bones and some of them softened.

- 31.—5 yrs. 4 mos. Grave 5 ft., wet; sand and clay. Interred February 4, 1892. Thysanura, undetermined.

Coleoptera, Staphylinidæ, *Eleusis pallida* Lec., numerous.

Hymenoptera, Myrmicidæ, *Cremastogaster lineolata* Say.

- 32.—5 yrs. 4 mos. Grave 5 ft., moist; sand and clay. Interred February 29, 1892.

Thysanura, in great numbers, undetermined.

Coleoptera, Carabidæ, *Harpalus faunus* Say, 1 specimen.

" Staphylinidæ, fragments (*Eleusis*?).

The carabid beetle was probably accidental.

- 33.—5 yrs., 4 mos. Grave 3 ft., moist; sand and clay. (Infant.) Phthisis. Interred February 22, 1892.

Myriapod, larva.

Coleoptera, Staphylinidæ, larva (*Philonthus*?).

" Nitidulidæ, *Rhizophagus sculpturatus* Mann., 7 specimens.

Skeleton completely stripped and dry; some clothing still remaining.

- 34.—5 yrs., 5 mos. Grave 5 ft., wet; sand and clay. Pneumonia. Interred January 18, 1892.

Thysanura, undetermined.

Coleoptera, Staphylinidæ, *Actobius umbripennis* Lec., 1 specimen.

" " *Eleusis pallida* Lec., 2 and fragments.

- 35.—5 yrs. 5 mos. Grave 5 ft., wet; sand and clay. Peritonitis. Interred January 18, 1892.

Acarina, Gamasidæ, *Uropoda depressa* Bks., sp. n.

Thysanura, undetermined.

Coleoptera, Staphylinidæ, *Eleusis pallida* Lec., numerous.

" Larvæ undetermined.

Beetles and larvæ burrowing in adipocere and soft bones.

- 36.—5 yrs. 5 mos. Grave 5 ft., wet; sand and clay. Cerebral congestion. Interred January 18, 1892.

Acarina, Gamasidæ, *Uropoda depressa* Bks., sp. n.

Thysanura, undetermined.

Coleoptera, Staphylinidæ, *Eleusis pallida* Lec., fragments.

Diptera, Phoridæ, puparia.

Probably embalmed. Soft tissues almost disappeared.

- 37.—5 yrs. 5 mos. Grave 5 ft., moist; sand and clay. Consumption. Interred January 24, 1892.

Acarina, Gamasidæ, *Uropoda depressa* Bks., sp. n.

Thysanura, undetermined.

Coleoptera, Staphylinidæ, *Eleusis pallida* Lec., 2 and fragments.

Coleoptera, Nitidulidæ, *Rhizophagus sculpturatus* Mann., 1 specimen.

" Larvæ, undetermined.

38.—6 yrs. Grave 5 ft., moist; sandy. (Infant.) Tuberculosis. Interred June 31, 1891.

Pseudoscorpiones, *Chelanops tristis* Bks.

Myriapoda, undetermined.

Diptera, Phoridae, puparia, in great numbers.

39.—6 yrs. 2 mos. Grave 5 ft., moist; sand and clay. Pneumonia. Interred April 22, 1891.

Acarina, Gamasidæ, *Uropoda depressa* Bks., sp. n.

Thysanura, undetermined.

Coleoptera, Staphylinidæ, *Homalota*, sp., 1 specimen and larva.

" " *Eleusis pallida* Lec., numerous.

" Nitidulidæ, *Rhizophagus sculpturatus* Mann.

Soft tissues almost disappeared. Beetles in great numbers about patella and sternum.

40.—6 yrs. 3 mos. Grave 5 ft., coffin submerged; sand and clay. Pneumonia. Interred April 2, 1891.

Thysanura, in great numbers, undetermined.

No other insects seen. While grave was wet, cadaver had evidently been mummified. Skeleton stripped and disarticulated; muscles almost disappeared, only an outer shell of adipocere which preserved general outline of cadaver.

41.—6 yrs. 5 mos. Grave 6 ft., coffin submerged; sand and clay. Interred December 26, 1890.

Thysanura, undetermined.

Diptera, Sepsidæ, *Piophilæ casei* Linn., puparia.

42.—6 yrs. 5 mos. Grave 5 ft., coffin submerged; sand and clay. Phthisis. Interred January 23, 1891.

Thysanura, undetermined.

✓ Coleoptera, fragments, undetermined.

Diptera, Phoridae (?), puparium.

Nothing but hard bones left.

43.—6 yrs. 5 mos. Grave 5 ft., wet; sand and clay. Senile debility. Interred February 1, 1891.

Thysanura, undetermined.

Coleoptera, Staphylinidæ, *Actobius umbripennis* Lec., 1 specimen.

" " *Eleusis pallida* Lec., numerous.

" Larvæ, undetermined.

All soft tissues gone. Thysanura, beetles and larvæ working inside the bones, entering through nutrient canals, etc.

44.—6 yrs. 5 mos. Grave 5 ft., coffin submerged; sand and clay. Senile debility. Interred February 2, 1891.

Thysanura, undetermined.

Thoracic and abdominal cavities emptied; lower ends of limbs (upper and lower) stripped. Tissues (skin, fasciæ, muscles, tendons, vessels and nerves) still distinguishable about thighs.

- 45.—6 yrs. 9 mos. Grave 6 ft., coffin submerged; sand and clay. Cerebral embolism. Interred August 8, 1889.
Thysanura, undetermined.
- 46.—6 yrs. 11 mos. Grave 4 ft., coffin submerged; sand and clay. Interred May 18, 1890.
Myriapoda, undetermined.
Coleoptera, Staphylinidæ, *Eleusis pallida* Lec., 2 specimens.
Diptera, Sepsidæ, *Piophilæ casei* Linn., puparia.
- 47.—7 yrs. Grave 4 ft., moist; sand and clay. Still-born. Interred July 28, 1890.
Gastropoda, *Helicodiscus lineatus* Say.
Crustacea, undetermined.
Araneida, *Theridion subterranea* Bks., sp. n.
Thysanura, undetermined.
Diptera, Phoridæ, puparia.
Smaller bones, skull, etc., almost disintegrated and pulverizable. Snails from coffin lid; spider and a few thysanura inside.
- 48.—7 yrs. Grave 5 ft., moist; sand and clay. Interred ——— 1889.
Thysanura, undetermined.
Coleoptera, Staphylinidæ, *Actobius umbripennis* Lec., 3 and larvæ.
“ “ *Eleusis pallida* Lec., numerous.
“ “ Undetermined, covered with fungus.
“ Larvæ, undetermined.
Skeleton stripped and disarticulated lying within shell of adipocere. Clothing fairly preserved.
- 49.—7 yrs. 4 mos. Grave 5 ft., coffin submerged; sand and clay. Interred December 16, 1889.
Thysanura, undetermined.
Coleoptera, Staphylinidæ, *Eleusis pallida* Lec., 2 specimens.
- 50.—7 yrs. 4 mos. Grave 5 ft., moist; sand and clay. Typhoid. Interred May 5, 1890.
Araneida, *Theridion subterranea* Bks., sp. n.
Acarina, Gamasidæ, *Uropoda depressa* Bks., sp. n.
Thysanura, undetermined.
Coleoptera, Staphylinidæ, *Eleusis pallida* Lec.
“ Larvæ, undetermined.
Diptera, Sepsidæ, *Piophilæ casei* Linn., puparia.
“ Borboridæ, *Limosina* ? wings.
Hymenoptera, Myrmicidæ, *Aphenogaster*, sp.
Skeleton completely stripped and disarticulated. Black, wet, powdery debris in bottom of coffin, alive with mites, thysanura and a few larvæ.
- 51.—7 yrs. 4 mos. Grave 5 ft., moist; sand and clay. Valvular disease of heart. Interred March 4, 1890.
Thysanura, undetermined.
Coleoptera, Staphylinidæ, *Eleusis pallida* Lec.
“ Larvæ, undetermined.
Thorax not yet evacuated. Heavy case of adipocere; within, skeleton pretty well cleaned.

- 52.—7 yrs. 7 mos. Grave 5 ft., moist; sand and clay. Exposure to cold (!). Interred December 7, 1889.
 Thysanura, undetermined.
 Coleoptera, Staphylinidæ, *Eleusis pallida* Lec., fragments.
 Skeleton completely stripped.
- 53.—7 yrs. 7 mos. Grave 5 ft., moist; sand and clay. Inanition. Interred December 13, 1889.
 Acarina, Gamasidæ, *Uropoda depressa* Bks., sp. n.
 Thysanura, undetermined.
 Coleoptera, Staphylinidæ, *Eleusis pallida* Lec., fragments.
 “ Larvæ, undetermined.
 Diptera, Phoridae, puparia.
 Skeleton stripped.
- 54.—7 yrs. 8 mos. Grave 5 ft., moist; sand and clay. Intermittent fever. Interred November 15, 1889.
 Thysanura, undetermined.
 Coleoptera, Staphylinidæ, *Eleusis pallida* Lec., fragments.
 Skeleton stripped. Coffin dry inside, completely overgrown with roots.
- 55.—7 yrs. 8 mos. Grave 5 ft., wet, sand and clay. Obstruction of bowels. Interred November 10, 1889.
 Thysanura, undetermined.
 Coleoptera, Staphylinidæ, *Eleusis pallida* Lec., 2 specimens.
 “ Larvæ, undetermined.
 Skeleton stripped.
- 56.—7 yrs. 8 mos. Grave 5 ft., moist; sand and clay. Accident. Interred October 7, 1889.
 Coleoptera, Staphylinidæ, *Actobius umbripennis* Lec.
 “ “ *Eleusis pallida* Lec.
 Skeleton stripped and disarticulated; adipocere almost consumed.
- 57.—7 yrs. 9 mos. Grave 3 ft., moist; sand and clay. Diphtheria. Interred October 17, 1889.
 Thysanura, undetermined.
 Coleoptera, Staphylinidæ, *Eleusis pallida* Lec., 6 specimens.
 “ Larvæ, undetermined.
 Skeleton stripped and disarticulated, lying within heavy case of adipocere which was very black on surface. Many *Eleusis* dead on outside of coffin. This cadaver in same grave with 58.
- 58.—7 yrs. 9 mos. Grave 5 ft., moist; sand and clay. Diphtheria. Interred October 1, 1889.
 Thysanura, undetermined.
 Coleoptera, Staphylinidæ, *Actobius umbripennis* Lec., 1 specimen.
 “ “ *Eleusis pallida* Lec., numerous.
 “ Larvæ, undetermined.
 Very little adipocere left. This buried in same grave underneath No. 57.
- 59.—7 yrs. 10 mos. Grave 5 ft., moist; sand and clay. Dysentery. Interred September 24, 1889.
 Coleoptera, Staphylinidæ, *Eleusis pallida* Lec., 2 specimens.
 Coffin too full of earth to examine thoroughly. Specimens from skull.

- 60.—7 yrs. 10 mos. Grave 5 ft., moist; sand and clay. Pneumonia. Interred September 16, 1889.
 Thysanura, in great numbers, undetermined.
 Coleoptera, Staphylinidæ, *Eleusis pallida* Lec., 2 specimens.
 Cadaver large and heavy; outlines preserved by heavy case of adipocere, skeleton within stripped.
- 61.—7 yrs. 10 mos. Grave 5 ft., moist; sand and clay. Heart disease (!). Interred September 14, 1889.
 Thysanura, in great numbers, undetermined.
 Coleoptera, Staphylinidæ, *Eleusis pallida* Lec., 8 specimens.
 Many *Eleusis* on coffin lid, outside and in. Skull entirely stripped; heavy case of adipocere below this; within, skeleton stripped.
- 62.—8 yrs. 2 mos. Grave 5 ft., moist; sand and clay. Convulsions (!). Interred May 5, 1889.
 Thysanura, undetermined.
 Coleoptera, Staphylinidæ, *Actobius umbripennis* Lec., 3 specimens.
 “ “ *Eleusis pallida* Lec., numerous.
 “ “ Larvæ (*Eleusis* ?).
 “ Nitidulidæ, *Rhizophagus scalpturatus* Mann., numerous.
 Upper half of cadaver completely stripped. Myriads of thysanura, beetles and larvæ on lower half, on and under clothing and in adipocere.
- 63.—8 yrs. 2 mos. Grave 5 ft., moist; sand and clay. Phthisis. Interred April 27, 1889.
 Thysanura, undetermined.
 Coleoptera, Staphylinidæ, *Eleusis pallida* Lec.
 Bones completely stripped; but one beetle and few thysanura seen.
- 64.—8 yrs. 2 mos. Grave 5 ft., moist; sand and clay. Debility (!). Interred May 3, 1889.
 Thysanura, undetermined.
 Coleoptera, Staphylinidæ, *Actobius umbripennis* Lec., 1 specimen.
 “ “ *Eleusis pallida* Lec., numerous.
 “ Nitidulidæ, *Rhizophagus scalpturatus* Mann., 4 specimens.
 “ Larvæ, undetermined.
 Thysanura, beetles and larvæ in layers of adipocere, about pelvis, and on skull under hair.
- 65.—8 yrs. 3 mos. Grave 5 ft., wet; sandy. (Infant.) Malnutrition. Interred February 2, 1888.
 Thysanura, undetermined.
- 66.—9 yrs. 4 mos. Grave 6 ft., coffin submerged; sand and clay. Interred January 27, 1888.
 Thysanura, undetermined.
 Diptera, Sepsidæ, *Piophilæ casei* Linn., puparia.
- 67.—9 yrs. 9 mos. Grave 5 ft., moist; sand and clay. Phthisis. Interred September 18, 1887.
 Thysanura, undetermined.
 Coleoptera, Staphylinidæ, *Lathrobium simile* Lec., 3 specimens.
 “ “ *Eleusis pallida* Lec., 6 specimens.
 Diptera, Phoridæ, puparia.

- 68.—10 yrs. Grave 5 ft., wet; sand and clay. Phthisis. Interred July 7, 1887.
 Thysanura, undetermined.
 Coleoptera, Staphylinidæ, *Eleusis pallida* Lec., 3 and fragments.
 " Fragments, undetermined.
 Diptera, Phoridae, puparia.
- 69.—10 yrs. Grave 5 ft., moist; sand and clay. Diarrhoea. Interred July 14, 1887.
 Crustacea, undetermined.
 Thysanura, undetermined.
 Coleoptera, Staphylinidæ, *Homalota*, sp.
 " " *Eleusis pallida* Lec.
 " Larvæ, undetermined.
 Diptera, Phoridae, puparia.
 Thysanura, beetles and larvæ burrowing in wood of coffin, in layers of adipocere, and in cancellated bone tissue, sternum, patella, etc.
- 70.—10 yrs. 2 mos. Grave 4 ft., coffin submerged; sand and clay. (Infant.)
 Marasmus. Interred April 25, 1887.
 Thysanura, undetermined.
 Coleoptera, Staphylinidæ, *Eleusis pallida* Lec., 10 specimens.
- 71.—10 yrs. 3 mos. Grave 5 ft., coffin submerged; sand and clay. Phthisis. Interred March 6, 1887.
 Thysanura, undetermined.
- 72.—10 yrs. 3 mos. Grave 6 ft., coffin submerged; sand and clay. Interred March 9, 1887.
 Thysanura, undetermined.
 Coleoptera, Staphylinidæ, *Eleusis pallida* Lec.
 Diptera, Sepsidæ, *Piophilæ casei* Linn., puparia.
 Pupæ apparently viable when taken but failed to breed in the laboratory.
- 73.—10 yrs. 4 mos. Grave 5 ft., coffin submerged; sand and clay. Cholera. Interred February 15, 1887.
 Gastropoda, *Helicodiscus lineatus* Say.
 Vermes, undetermined.
 Crustacea, *Armadillidium* ?
 Thysanura, undetermined.
 Coleoptera, Staphylinidæ, *Eleusis pallida* Lec., 3 specimens.
- 74.—10 yrs. 7 mos. Grave 9 ft., damp; loose sand. Tetanus. Interred September 21, 1885.
 Crustacea, *Armadillidium vulgare* Ltr., 3 specimens.
 Thysanura, *Isotoma*, sp.
- 75.—10 yrs. 8 mos. Grave 5 ft., coffin submerged; sand and clay. Consumption. Interred September 23, 1886.
 Thysanura, undetermined.
 Coleoptera; Nitidulidæ, *Rhizophagus scalpturatus* Mann., 7 specimens.
- 76.—10 yrs. 8 mos. Grave 6 ft., coffin submerged; sand and clay. Consumption. Interred October 3, 1886.
 Thysanura, undetermined.

- 77.—11 yrs. 2 mos. Grave 5 ft., coffin submerged; sand and clay. Hepatic colic. Interred April 8, 1886.
 Thysanura, undetermined
 Coleoptera, Staphylinidæ, *Eleusis pallida* Lec.
- 78.—12 yrs. 11 mos. Grave 6 ft., dry; sandy. Phthisis. Interred July 27, 1883.
 Crustacea, undetermined.
 Araneida, *Bathyphantes*, sp. n.; *Cicurina arcuata* Keys.
 Myriapoda, *Isobates* (*I. minutus* Brandt?); *Iulus*, sp.
 Pseudoneuroptera, *Termes flavipes* Kollar, 7 specimens.
 Coleoptera, Staphylinidæ, larva undetermined.
 “ Nitidulidæ, *Rhizophagus sculpturatus* Mann., fragments.
 Diptera, Phoridæ, puparia.
- 79.—15 yrs. 5 mos. Grave 7 ft., dry; sandy. (Infant.) Diphtheria. Interred December 17, 1880.
 Araneida, *Cicurina creber* Bks.
 Myriapoda, *Iulus*, sp., numerous.
 Coleoptera, Staphylinidæ, *Staphylinus cinnamopterus* Grav., 2 specimens, probably accidental, found outside coffin in grave.
 Diptera, Phoridæ, puparia.
- 80.—15 yrs. 10 mos. Grave 4 ft., coffin submerged; sand and clay. Interred September 29, 1881.
 Thysanura, undetermined.
 Coleoptera, Carabidæ, *Schizogenius amphibius* Hald., fragments, probably accidental.
 Diptera, Phoridæ, puparia.
- 81.—16 yrs. 5 mos. Grave 9 ft., moist; sand. Apoplexy. Interred January 18, 1881.
 Gastropoda, *Zonitoides minusculus* Binn.
 Vermes, undetermined.
 Crustacea, undetermined.
 Pseudoscorpiones, *Chelanops tristis* Bks.
 Araneida, *Cicurina creber* Bks.; *Theridion subterranea* Bks., sp. n.; *Erigone albescens* Bks., sp. n.
 Myriapoda, undetermined.
 Thysanura, undetermined.
 Coleoptera, Pselaphidæ, *Batrissus* (*ferox*?).
 “ Nitidulidæ, *Rhizophagus sculpturatus* Mann., fragments.
 Diptera, Phoridæ, puparia.
 Hymenoptera, Formicidæ, *Lasius flavus* De Geer.
 Dry disarticulated bones and portion of coat lying in brown, powdery debris, fairly swarming with the above animals.
- 82.—18 yrs. 11 mos. Grave 3 ft., dry; sandy. (Infant.) Aphtha. Interred January 18, 1879.
 Crustacea, undetermined.
 Araneida, *Bathyphantes*, sp. n.
 Myriapoda, *Isobates* (*I. minutus* Brandt?) numerous; *Iulus*, sp.

- 83.—20 yrs. Grave 3 ft., dry; sandy. (Infant.) Gastritis. Interred June 26, 1876.
 Vermes, undetermined.
 Crustacea, undetermined.
 Myriapoda, *Isobates* (*I. minutus* Brandt?); *Iulus*, sp.
 Diptera, Phoridae, puparia.
- 84.—20 yrs. Grave 9 ft., dry; sandy. Enteritis. Interred May 9, 1876.
 Diptera, Phoridae, puparia.
- 85.—20 yrs. 3 mos. Grave 5 ft., dry; sandy. (Infant.) Meningitis. Interred February 14, 1876.
 Myriapoda, *Isobates* (*I. minutus* Brandt?); *Iulus*, sp.
 Diptera, Phoridae, puparia.
- 86.—20 yrs. 7 mos. Grave 4 ft., dry; sandy. (Infant.) Pertussis. Interred August 8, 1875.
 Gastropoda, *Vitrea electrina* Gould.
 Thysanura, *Japyx* (*J. subterraneus* Pack.?).
 Diptera, Phoridae, puparia.
- 87.—20 yrs. 9 mos. Grave 6 ft., dry, sandy. (Infant.) Diarrhoea. Interred August 26, 1875.
 Myriapoda, *Iulus*, sp.
 Coleoptera, Carabidae, *Dicælus ovalis* Lec., 1 specimen. Probably accidental, from bottom of grave.
 “ Elateridae, larvæ, undetermined, fragment.
 Diptera, Phoridae, puparia.
- 88.—21 yrs. Grave 3 ft., dry; sandy. (Infant.)
 Gastropoda, *Zonitoides minusculus* Binn.
 Vermes, undetermined.
 Myriapoda, *Isobates* (*I. minutus* Brandt?); *Iulus*, sp.
 Diptera, Phoridae, puparia.
- 89.—21 yrs. Grave 3 ft., dry, sandy.
 Gastropoda, *Helicodiscus lineatus* Say.
 Araneida, *Theridium*, sp. (*T. subterranea* Bks.?).
 Myriapoda, *Isobates* (*I. minutus* Brandt?); *Iulus*, sp.; *Striaria*, sp.; *Scolopocryptops sexspinosus* Say.
 Coleoptera, Trogositidae, *Tenebrioides laticollis* Horn. Fragments.
 Diptera, Phoridae, puparia.
- 90.—21 yrs. Grave 3 ft., dry, sandy. (Infant.)
 Myriapoda, *Iulus*, sp.
 Diptera, Phoridae, puparia.
- 91.—21 yrs. Grave 4 ft., dry, sandy. (Infant.)
 Gastropoda, *Helicodiscus lineatus* Say.
 Myriapoda, *Isobates* (*I. minutus* Brandt?).
 Coleoptera, Pselaphidae, *Batrissus ferox* Lec.
 Diptera, Phoridae, puparia.
- 92.—21 yrs. Grave 4 ft., dry, sandy. (Infant.)
 Myriapoda, *Isobates* (*I. minutus* Brandt?); *Iulus*, sp.
 Diptera, Phoridae, puparia.

- 93.—21 yrs. Grave 4 ft., dry, sandy. (Infant.)
 Gastropoda, *Helicodiscus lineatus* Say.
 Araneida, *Cicurina creber* Bks.
 Myriapoda, *Isobates* (*I. minutus* Brandt ?) ; *Iulus*, sp.
 Coleoptera, Scarabæidæ, *Lachnosterna*, sp. Probably accidental.
 Diptera, Phoridæ, puparia.
 Hymenoptera, Formicidæ, *Brachymyrmex heeri* Forel.
 “ Poneridæ, *Ponera contracta* Latr.
 “ Myrmicidæ, *Myrmicina latreilli* André.
- 94.—21 yrs. Grave 6 ft., dry, sandy. (Infant.)
 Myriapoda, *Iulus*, sp.
 Diptera, Phoridæ, puparia.
- 95.—21 yrs. Grave 6 ft., dry, sandy. (Infant.)
 Gastropoda, *Helicodiscus lineatus* Say.
 “ *Zonitoides minusculus* Binn.
 Araneida, *Lophocarenum*, sp.
 Myriapoda, *Isobates* (*I. minutus* Brandt ?) ; *Iulus*, sp.
 Thysanura, *Lepidocyrtus*, sp.
 Diptera, Phoridæ, puparia.
- 96.—21 yrs. Grave 6 ft., dry, sandy. (Infant.)
 Araneida, Agalenidæ (*Cicurina* ?).
 Myriapoda, *Isobates* (*I. minutus* Brandt ?) ; *Iulus*, sp.
 Diptera, Phoridæ, puparia.
- 97.—27 yrs. Grave 8 ft., dry, sandy. (Infant.) Interred November 2, 1869.
 Myriapoda, undetermined.
 Diptera, Phoridæ, puparia. (*Conicera* ?)
- 98.—29 yrs. 1 mo. Grave 6 ft., dry, sandy. (Infant.) Interred May 25, 1867.
 Araneida, *Argiope*, sp.
 Hymenoptera, Formicidæ, *Lasius americanus* Emery.
- 99.—38 yrs. 4 mos. Grave 6 ft., dry ; sandy. Interred June 29, 1861.
 Araneida, *Cicurina creber* Bks.
 Acarina, Gamasidæ, *Gamasus*, sp.
 Myriapod, undetermined.
 Diptera, Phoridæ, puparia (*Conicera* ?).
- 100.—71 yrs. Grave 6 ft., dry ; sandy.
 Gastropoda, *Helicodiscus lineatus* Say.
 Acarina, *Hypopus*, sp.
 Bones dry and crumbling ; rib picked up by its sternal end broke and crushed in falling by its own weight. Oscalcis, astragalus, head of femur, etc., crushed with little or no pressure. Wood of coffin dry and crumbling ; medullary rays beautifully and clearly outlined ; penetrated, more especially through long diameter, by numerous dead, dry, filamentous roots. Knots curiously demarcated and encapsulated. All dry, brown and pulverulent.

Note 1. Numbers 88–96 inclusive were interred prior to 1875, before the cemetery records were fully kept.

2. Numbers 5; 38, 74, 78; 79, 81-99 inclusive, are especially noteworthy on account of the unusual method of interment followed in the cemetery from which all were taken. Here, in every instance, each separate burial case is inclosed in a four-inch brick wall, laid in cement, and covered with stone or slate slabs, likewise sealed with cement, thus making what is practically a vault for each interment. This, it would seem, would prove an almost impenetrable barrier to the necrophagous fauna. It must be remembered, however, that, no matter how carefully prepared and laid, this cement, sooner or later, disintegrates; and that, save where two or more interments are made in the same grave-site—as is here not infrequently the case—the bottom of these vault-chambers is of earth, not of brick or stone. But, even where one vault is built on top of another, the crumbling cement leaves interstices between the bricks, through which, as we have seen, come diverse sorts of animals.

The following list of fifty cases includes those in which the examination was, for one reason or another, incomplete, the records fragmentary or unreliable, or the specimens lost.

101.—5 mos. Grave 6 ft., dry; sandy. Pneumonia. Interred January 22, 1896.

No insects found. Body embalmed and in good state of preservation.

Slight whitish fungus over lower part of face and hands.

102.—1 yr. 2 mos. Grave 4 ft., moist; sand. Gastro-enteritis. Interred April 29, 1896.

On outside of coffin, chelifer, spider and thysanura; inside no insects found.

Cadaver embalmed, tissue leathery, covered with thick, white, felt-like fungus.

103.—3 yrs. Grave 6 ft., dry; sandy. Consumption. Interred May 11, 1894.

Chelanolops tristis Bks. and thysanura on outside of coffin. No insects inside.

Body embalmed. Bones of skull clean, covered with thick, white fungus.

Examination interrupted.

104.—3 yrs. 3 mos. Grave 7 ft., day; sandy. Asphyxia. Interred July 20, 1893.

Body embalmed and well preserved. Face and hands covered with thick, white fungus. No insects found.

105.—4 yrs. Grave 5 ft., moist; sand and clay. Interred July 14, 1893.

Had not sufficient time to examine thoroughly. Fragments of numerous staphylinids (*Eleusis pallida* Lec.?) no specimens taken.

106.—4 yrs. 1 mo. Grave 5 ft., coffin submerged; sand and clay. Valvular disease heart. Interred May 1, 1893.

Too wet to handle. Coffin contained embalming fluid. Skull stripped, some adipocere still remaining on lower limbs.

107.—4 yrs. 2 mos. Grave 3 ft., moist; sand and clay. Still-born. Interred April 24, 1893.

Gastropoda, *Helicodiscus lineatus* Say.

Diptera, Sepsidæ, *Piophilæ casei* Linn., puparia.

- 108.—4 yrs. 4 mos. Grave 3 ft., moist; sand and clay. (Infant.) Interred March 11, 1893.
A few thysanura only. Everything but the disarticulated bones gone.
Coffin dry inside; roots and grasses growing up through bones and remnants of clothing.
- 109.—4 yrs. 7 mos. Grave 5 ft., coffin submerged; sand and clay. Pneumonia. Interred December 12, 1892.
Thysanura only. Considerable adipocere left. Intestines not yet destroyed.
In vault 1 month.
- 110.—5 yrs. 3 mos. Grave 6 ft., coffin submerged; sand and clay. Interred February 29, 1892.
Thysanura only. In vault 2 months.
- 111.—5 yrs. 4 mos. Grave 5 ft., coffin submerged; sand and clay. Cholera. Interred February 26, 1892.
Thysanura and staphylinid fragments, specimens lost. Heavy case of adipocere, swarming with Thysanura.
- 112.—5 yrs. 5 mos. Grave 5 ft., coffin submerged; sand and clay. Pneumonia. Interred January 2, 1892.
Coleoptera, Staphylinidæ, *Actobius umbripennis* Lec.
- 113.—6 yrs. 2 mos. Grave 5 ft., moist; sand and clay. Paralysis. Interred April 28, 1891.
Coffin too much broken in removal to be accurate about contents.
- 114.—6 yrs. 5 mos. Grave 5 ft., coffin submerged; sand and clay. Inflammation bowels. Interred February 9, 1891.
No insects, *not even Thysanura!*
- 115.—6 yrs. 5 mos. Grave 5 ft., coffin submerged; sand and clay. Pneumonia. Interred February 2, 1891.
Skeleton completely disarticulated, even skull, which contained pulaceous brain mass. Little adipocere left.
- 116.—6 yrs. 7 mos. Grave 5 ft., coffin submerged; sand and clay. Interred December 18, 1890.
No insects found. Clothing almost intact. Skeleton stripped and disarticulated.
- 117.—6 yrs. 9 mos. Grave 5 ft., coffin submerged; sand and clay. Typhoid. Interred September 7, 1890.
Thysanura only.
- 118.—7 yrs. 3 mos. Grave 9 ft., dry; sandy. Hemorrhage from lungs. Interred July 27, 1889.
Thysanura and acarids. Specimens lost.
- 119.—7 yrs. 5 mos. Grave 5 ft., coffin submerged; sand and clay. Membraneous croup. Interred January 20, 1890.
Coleoptera, Staphylinidæ, *Actobius umbripennis* Lec., fragment, covered with undetermined fungus.
“ “ *Eleusis pallida* Lec.
- 120.—7 yrs. 5 mos. Grave 5 ft., moist; sand and clay. Phthisis. Interred February 27, 1890.
Thysanura, undetermined.

- Coleoptera, Staphylinidæ, *Actobius umbripennis* Lec., one dead covered with
 " " white fungus.
 " " *Eleusis pallida* Lec.
 " " Undetermined.
- Diptera, Sepsidæ, *Piophilæ casei* Linn., puparia.
 " Borboridæ, *Limosinia*, sp., wings.
- Skeleton completely stripped, no adipocere left.
- 121.—7 yrs. 5 mos. Grave 5 ft., moist; sand and clay. Chronic diarrhœa. Interred February 24, 1890.
- Gastropoda, *Helicodiscus lineatus* Say.
 " *Zonitoides arboreus* Say.
- Araneida, *Theridion subterranea* Bks., sp. n.
- Coleoptera, larvæ, undetermined.
- Diptera, Sepsidæ, *Piophilæ casei* Linn., puparia.
- Skeleton completely stripped.
- 122.—7 yrs. 7 mos. Grave 6 ft., coffin submerged; sand and clay. Interred September 15, 1889.
- Skeleton completely stripped and disarticulated; bones solid and black as ebony, some small detached masses of adipocere still remaining in coffin.
- Not a sign of an insect to be found.
- 123.—7 yrs. 10 mos. Grave 5 ft., moist; sand and clay.
- Coffin crushed in and full of earth, no specimens taken.
- 124.—7 yrs. 10 mos. Grave 5 ft., moist; sand and clay.
- Coffin crushed in and full of earth, no specimens taken.
- 125.—8 yrs. 4 mos. Grave 5 ft., coffin submerged; sand and clay. Congestion brain. Interred March 9, 1889.
- In vault 1 month. Skeleton completely stripped; a few masses of adipocere left from lower abdominal walls. No specimens taken.
- 126.—10 yrs. 1 mo. Grave 5 ft., coffin submerged; sand and clay. Dropsy (!). Examined by assistant, no specimens.
- 127.—10 yrs. 1 mo. Grave 5 ft., coffin submerged.
- Coleoptera, Staphylinidæ, *Actobius umbripennis* Lec., fragments.
- 128.—10 yrs. 2 mos. Grave 5 ft., coffin submerged; sand and clay. Interred April 3, 1887.
- A few Thysanura only. No specimens taken.
- 129.—11 yrs. Grave 5 ft., dry; sandy. Still-born. Interred October 24, 1885.
- Diptera, Phoridæ, puparia (*Conicera* ?), specimens lost.
- 130.—11 yrs. Grave 5 ft., wet; sandy.
- Thysanura, undetermined.
- Coleoptera, Staphylinidæ, *Eleusis pallida* Lec.
- 131.—11 yrs. 7 mos. Grave 5 ft., wet; sandy. Tetanus. Interred November 1884.
- Araneida, *Lepthyphantes*, sp.
- Pseudoneuroptera, *Termes flavipes* Kollar.
- Diptera, Phoridæ, puparia.
- In vault three months. Ob. 30, VIII, 84.
- 132.—12 yrs. 3 mos. Grave 6 ft., coffin submerged; sand and clay. Phthisis. Interred February 29, 1884.

Thysanura only. In vault 1 month.

- 133.—14 yrs. 5 mos. Grave 6 ft., dry "rotten rock." Peritonitis. Ob. 5, IX, 81, Mass. Interred November 22, 1881; D. C.

Diptera, Phoridae, puparia.

Cadaver mummified, surface moist, skin and appendages practically intact.

Coffin in tin-lined case, top tacked on.

- 134.—14 yrs. 8 mos. Grave 5 ft., dry, sandy. Hydrocephalus. Interred March 3, 1882.

Diptera, Phoridae, puparia (*Conicera*?), specimens lost.

- 135.—16 yrs. Grave 9 ft., dry, sandy. Oedema of lungs. Interred October 9, 1880. Thysanura only. In vault 9 days.

- 136.—18 yrs. 2 mos. Grave 5 ft., coffin submerged; sand and clay. Interred May 13, 1879.

No insects save a few Thysanura on inner side of coffin. Skeleton completely stripped and disarticulated. Some grayish brain matter still left within disarticulated skull.

- 137.—18 yrs. 3 mos. Grave 5 ft., coffin submerged; sand and clay. Membraneous Croup. Interred February 2, 1878.

No insects found.

- 138.—19 yrs. 2 mos. Grave 6 ft., dry, sandy. Bright's disease. Ob. 9, I, 77. Interred April 17, 1877.

Gastropoda, *Helicodiscus lineatus* Say.

Araneida, *Lophocarenum*, sp.; *Lycosa*, sp.

Hymenoptera, Formicidae, *Camponotus melleus* Say.

- 139.—20 yrs. 3 mos. Grave 5 ft., wet, sand and clay. Phthisis. Interred April 5, 1876.

No insects found.

- 140.—24 yrs. 5 mos. Grave 5 ft., dry, sandy. Dysentery. Ob. 13, III, 72. Interred May 25, 1872.

Gastropoda, *Helicodiscus lineatus* Say.

Araneida, *Cicurina creber* Bks.

Acarina, *Hypopus*, sp.

Myriapoda, *Isobates* (*I. minutus* Brandt?); *Iulus*, sp.

Thysanura, undetermined.

Diptera, Phoridae, puparia (*Conicera*?).

In vault two months.

- 141.—28 yrs. Grave 9 ft., dry, sandy. Pneumonia. Ob. 25, IX, 68, N. J. Interred April 25, 1884, D. C.

Crustacea, undetermined.

Pseudoscorpiones, *Chelanops tristis* Bks.

Araneida, *Theridium tepidariorum* Koch.

Acarina, Gamasidae, *Hypoaspis*, sp.

Myriapoda, *Isobates* (*I. minutus* Brandt?); *Iulus*, sp.

Thysanura, *Entomobrya*, sp.

Coleoptera, Pselaphidae, *Batriscus globosus* Lec.

" Nitidulidae, *Rhizophagus scalpaturatus* Mann.

Diptera, Drosophilidae, *Drosophila ampelophila* Loew, probably accidental.

- 142.—36 yrs. No insects found.
 143.—36 yrs. (Infant.) No insects found.
 144.—36 yrs. (Infant.) No insects found.
 145.—56 yrs. (Infant.) No insects found.
 146.—Coffin so decayed and grave so wet, no definite results obtainable.
 147.—Coffin so decayed and grave so wet, no definite results obtainable.
 148.—Murder case, coffin filled with all sorts of rubbish; not examined.
 149.—Negro, aet. 18 yrs. (?) drowned, 7th St. wharf, August 29th. Body recovered August 30th, inclosed in tin-lined case August 31st. Examined at Morgue September 2d. Larvæ taken from hair, face and clothing, September 16th bred:
 Diptera, Muscidæ, *Comptosia macellaria* Fabr.
 “ “ *Lucilia caesar* Linn.
 150.—7 yrs. 3 mos. Grave 4 ft., moist, sand and clay. Premature birth. No cadaver found in coffin, nothing to indicate that it had ever been placed therein. Clothes nicely folded in bottom of coffin. A most thorough search revealed but the following:
 Thysanura, undetermined.
 Coleoptera, Staphylinidæ, *Eleusis pallida* Lec., 1 specimen.
 “ Larvæ, undetermined.
 Diptera, Phoridæ, puparium.

Note 3. Numbers 101–104, 118, 129, 133, 134, 135, 138, 140, 141 graves prepared as explained in note 2, page 217.

Note 4. The undetermined Coleopterous larvæ mentioned in the above lists belong, according to Mr. Schwarz, to but three species: *Actobius umbripennis* Lec., *Eleusis pallida* Lec. and *Rhizophagus sculpturatus* Mann. Owing to the illness of Mr. Schwarz, the determinations could not be specified in each case.

Grouped and arranged in systematic order, the fauna of the one hundred and fifty disinterments studied, as thus far determined, stands as follows:

GASTROPODA.

Helicodiscus lineatus Say. *Zonitoides minusculus* Binn.
Zonitoides arboreus Say. *Vitrea electrina* Gould.

Vermes, undetermined.

CRUSTACEA.

Armadillidium vulgare Ltr., many undetermined.

ARACHNIDA.

Pseudoscorpiones, *Chelanops tristis* Bks.

ARANEIDA.

Agalena, sp. *Lepthyphantes*, sp.
A. nevia Htz. *Lophocarenum*, sp.

- | | |
|-------------------------------|------------------------------------------|
| <i>Argiope</i> , sp. | <i>Lycosa</i> , sp. |
| <i>Bathyphantes</i> , sp. n. | <i>Theridium tepidariorum</i> Koch. |
| <i>Cicurina arcuata</i> Keys. | <i>Theridion subterranea</i> Bks., sp.n. |
| <i>Cicurina creber</i> Bks. | <i>Erigone albescens</i> Bks., sp. n. |

ACARINA.

- | | |
|-------------------------------------------------------|--------------------------------------|
| Gamasidæ, <i>Gamasus</i> , sp. | <i>Iphis</i> , sp. |
| <i>Holostaspis</i> , sp. | <i>Uropoda</i> , sp. |
| <i>Hypoaspis</i> , sp. | <i>Uropoda depressa</i> Bks., sp. n. |
| Tyroglyphidæ, <i>Tyroglyphus</i> , sp. | <i>Hypopus</i> , sp. |
| Oribatidæ, <i>Hoplophora</i> , sp. (<i>Tritia</i>). | |

MYRIAPODA.

- | | |
|-----------------------------------------------|----------------------------------------|
| <i>Isobates</i> (<i>I. minutus</i> Brandt?). | <i>Striaria</i> , sp. |
| <i>Iulus</i> , sp. | <i>Scolopocryptops sexspinosa</i> Say. |
| <i>Lithobius</i> , sp. | |

THYSANURA.

- | | |
|-------------------------------------------------------|-------------------------|
| <i>Japyx</i> , sp. (<i>J. subterranea</i> Packard?). | <i>Entomobrya</i> , sp. |
| <i>Lepidocyrtus</i> , sp. | <i>Podura</i> , sp. |
| Many undetermined. | |

PSEUDONEUROPTERA.

- | | |
|------------------------|--------------------------------|
| Psocidæ, undetermined. | <i>Termes flavipes</i> Kollar. |
|------------------------|--------------------------------|

HOMOPTERA.

- Coccidæ, *Ripersia*, sp.

COLEOPTERA.

- Carabidæ, *Schizogenius amphibius* Hald. *Dicælus ovalis* Lec.
 " *Harpalus faunus* Say.
- Pselaphidæ, *Batrissus ferox* Lec. *Batrissus globosus* Lec.
- Staphylinidæ, *Atheta*, sp. *Actobius pæderoides* Lec.
Homalota, sp. *Lathrobium simile* Lec.
Staphylinus cinnamopterus Grav. *Pæderus littorarius* Grav.
Philonthus, sp. *Eleusis pallida* Lec.
Actobius umbripennis Lec.
- Trichopterygidæ, *Trichopteryx haldemanni* Lec.
- Nitidulidæ, *Rhizophagus sculpturatus* Mann.
- Trogositidæ, *Tenebrioides laticollis* Horn.
- Elateridæ, *Monocrepidius bellus* Say.
- Scarabæidæ, *Lachnosterna*, sp.
- Curculionidæ, *Sphenophorus*, sp.

DIPTERA.

Mycetophilidæ, *Sciara*, sp.

Stratiomyidæ (larva).

Phoridæ (puparia), *Phora clavata* Loew; *Conicera*, sp.

Muscidæ, *Comptosia macellaria* Fabr.; *Lucilia cæsar* Linn.

Anthomyidæ, *Homalomyia*, sp.; *Ophyra leucostoma* Wied.

Sepsidæ, *Piophila casei* Linn.

Drosophilidæ, *Drosophila ampelophila* Loew.

Borboridæ, *Limosina*, sp.

HYMENOPTERA.

Formicidæ, *Brachymyrmex heeri* Forel.; *Camponotus melleus* Say.

“ *Lasius americanus* Emery; *Lasius flavus* DeGeer.

Poneridæ, *Ponera contracta* Latr.

Myrmicidæ, *Myrmicina latreillii* André.

Monomorium minutum Mayer.

Cremastogaster lineolata Say.

Aphenogaster, sp.

This list includes the names of a few species found, not in the one hundred and fifty human disinterments studied, but in the experimental observations, viz.: The undetermined Psocid, the Dipteran *Sciara* sp., and the Coleopteron *Trichopteryx haldemanni* Lec. were found in the empty boxes, buried for experimental purposes; while the Myriapod *Lithobius* sp., and the Diptera *Conicera* sp., *Phora clavata* Loew, and *Ophyra leucostoma* Wied., were found on dog cadavers, as noted elsewhere.

During the summer of 1896 the cadavers of a number of dogs, which had been examined in the laboratory for parasites, were tightly nailed up. each in a wooden box, and buried in a neighboring plot at a depth of two feet. Two of these, examined after two months, showed only the following Diptera: Phoridæ, *Phora clavata* Loew. Muscidæ, *Lucilia cæsar* Linn. Anthomyidæ, *Ophyra leucostoma* Wied. Of these, I have found only the Muscid on human cadavers, in four instances: (a) The living larvæ were found on the cadaver of a drowned negro after an exposure of three days and bred to the adult stage (No. 149). (b) The puparia were found on a cadaver (No. 2) which had been buried for two years and eleven months; and (c) puparia were likewise found on two cadavers (Nos. 11 and

14) which had been buried four years and one month. On the dog cadaver, buried two months, was found a fragment of one adult fly. This fly Mégnin puts in his second "squad," which arrives on cadavers a few hours after death. The Phorid was found in great numbers in the adult stage, busily feeding upon the contents of the box, which emitted a very pungent ammoniacal odor.

The Anthomyid was taken in the larval stage and bred in great quantities, in the laboratory, even unto the third and fourth generations. Notes of these breeding experiments were presented to the Entomological Society of Washington and will appear in the forthcoming issue of its Proceedings. Suffice it to say that, contrary to what has generally been known of the *Ophyra leucostoma* Wied., it seemed to thrive better upon decaying animal than upon vegetable matter. Mégnin places this fly in his fifth "squad," which he has found on human cadavers buried about two years. It is interesting to note just here that Schöyen found another species of this same genus, *Ophyra anthrax* Meig., in one of the cemeteries of Kristiania, in graves which had been dug but two months before, just the period of interment of the dogs in question. Schiner mentions *O. anthrax* as more rare than *O. leucostoma* still, in certain places very common; he found it in great numbers on the body of a dead horse in Kloster-neuberg.

On dogs buried for three months, this same Anthomyid, *O. leucostoma*, was found together with an undetermined Thysanuron and three Acarids of the Gamasid family: *Uropoda* sp., *Gamasus* sp. and *Hypoaspis* sp. The mites belong to Mégnin's sixth "squad," found on exposed human cadavers after two or three years. *Uropoda* I have found on twenty-one human cadavers, interred for periods varying from three years and six months to eleven years and seven months; *Hypoaspis*, on a human cadaver buried twenty-eight years; *Gamasus* on another, buried thirty-eight years and four months. While belonging to the same genus, it must be noted that the species of Gamasidæ found on dog cadavers are not identical with those found upon human cadavers.

On dogs buried for four months the principal find was the Phorid, *Conicera* sp., which was likewise bred in the laboratory through several generations. This fly is of special interest, because it was probably the first in America recorded by an accurate observer as having been found on a disinterred human cadaver; it will again be referred to later on.

On dogs buried for five months were found *Conicera* sp., adult flies and larvæ, together with *Uropoda* sp., identical with that found on dogs after three months' interment, but differing from that found on human cadavers; and, finally, an Elaterid beetle, *Monocrepidius bellus* Say, identical with that found on human cadavers after three years and two months' interment.

At this point the experimental work with dog cadavers ceased; first because there was such abundant material from the cemetery, and, secondly, because, according to Dr. Wyatt Johnston's experience, the results would be apt to be more confusing than helpful. Writing of his own observation in this line, Dr. Johnston said: "We were especially struck with the circumstance that Coleoptera which attack the bodies of animals early, *i. e.*, in a few days, will not attack human bodies unless these have been exposed some months. For this reason we avoided control experiments with dead animals and dead meat, as unreliable and misleading."

One other line of experimental investigation proved interesting and suggestive, though it was pursued in but two cases. At the suggestion of Mr. E. A. Schwarz, we buried in a cemetery, at a depth of three feet, two empty boxes which had been thoroughly cleaned and then closed with a well fitting cover securely nailed on. As it happened, we were enabled to place each of these boxes in a lot adjoining one in which an interment had recently been made, thus approximating, as nearly as might be, the conditions of an actual interment. After two months one of the boxes was taken up and found to contain a young Araneid, *Agalena nœvia* Htz., several young Acarids of the Gamasid family, many Podurids (Thysanura), an undetermined Psocid, one small beetle, *Trichopteryx haldemani* Lec., and three Mycetophilid flies, *Sciara* sp. The second box, which was buried for a little over three months, was not quite so prolific, containing only one Araneid, *Theridium tepidariorum* Koch, and a few Podurids and *Lepidocyrtus* sp. (Thysanura). These small insects were no doubt feeding upon the delicate black fungus with which the boxes had become lined.

It is highly probable that further experiments in this line might be productive of interesting results. In the last case noted in the above list (No. 150) an empty (?) coffin, exhumed after seven years and three months, contained, among other things, the same beetle, *Eleusis pallida* Lec., which was found in such great numbers and under such

varying conditions in fifty-six of the one hundred and fifty observations and after periods of interment ranging from one year and eleven months to eleven years and two months. The cemetery records show that this particular coffin was supposed to contain the product of a "Premature Birth," but it seems highly probable that the coffin was sent to the cemetery, minus the cadaver, and that the latter now adorns some one's embryologic collection.

In 1890 Mr. Webster published an interesting find of *Conicera* sp., on a two-year cadaver, in the stomach of which chemic analysis showed one and one-half grains of arsenic. Commenting on this case, Mr. Webster writes: "That the larvæ of these flies might subsist upon the flesh of bodies killed by arsenic is by no means surprising, as they are, doubtless, very tenacious of life. * * * That adults or larvæ could have made their way to the body through box and coffin, after burial, seems incredible; while that with the temperature but little above the freezing point flies should have been attracted to the corpse, while the latter was awaiting burial, and either deposited their eggs upon it before burial or have been conveyed within the coffin to the grave and there begun reproduction appears at first thought almost equally impossible."

Here, then, are raised the questions upon the answers to which rest the importance and practical value of all these observations. How, when and during what periods do these insects attack the human cadaver? Mégnin's answers seem to have been accepted by the French courts, and decisions rendered, sentences imposed in accordance therewith. His work has been abstracted in a large number of journals, and in several different languages; everywhere it is labelled "Important—if true." Dominique writes a conservative review, complimenting Mégnin upon his work, at the same time suggesting that the science of an entomologic chronology of cadaveric history must, of necessity, be a slow growth. Here and there, however, there have been more or less vigorous protests. It is significant that these protests and warnings have come largely from the entomologists, men whose sole specialty is the study of the characters and life habits of these insects. True, when we attempt to look up the life-history of any given insect, especially one not important from an economic standpoint, we are amazed at the paucity of data, even with regard to our most common species. Among those who have made the life habits of beetles a special study, is Major L. von Heyden, who denies Mégnin's assertion

that the Nitidulid beetle, *Rhizophagus*, is attracted by the odor of the corpse, and declares that this beetle never feeds upon cadavers, but that it enters the grave as a parasite of the larva of another beetle (Scolytid) which infests the wood of which coffins are made. In spite of this high authority, I have found, in a number of cases the American cousins of this beetle feeding, beyond the peradventure of a doubt, upon the decomposing soft tissues and in the cancellated bone of the human cadaver.

Another item, about which we have yet much to learn, is with regard to the seasonal activity of a number of flies. Mégnin states, and he is confirmed by Webster's and by own experience, that the Phoridae have been found on bodies interred in winter as well as in summer. But his conclusion, that the presence of Muscidæ indicates that the body in question was interred in summer and not in winter; and Johnston's and Villeneuve's conclusion, that the absence of Dipterous remains points to interment in winter and not in summer, have been too hastily drawn, if the study of but one hundred and fifty disinterments in Washington afford any criterion by which to judge. For, in ten of the one hundred and fifty cases, I have found the remains of a number of flies (Stratiomyid, Muscid, Sepsid and Borborid) on cadavers interred in December, January and February.

Two important facts must be noted just here: On the one hand, I have found, on looking up the recorded temperatures for several days preceding death and following burial, a degree of cold wholly incompatible with insect activity above ground; on the other hand, we not infrequently have in Washington, even in mid-winter, several successive days of sufficient warmth to start up the incubators of the omnipresent fly. That the presence of certain insects on a cadaver may indicate the exposure of that cadaver to a temperature favorable to the functional activity of these insects, is a conclusion wholly legitimate, and not without entomologic interest. Can it have any Medico-legal weight? To go before a Court of Law and to swear that because a Muscid was found upon a disinterred human cadaver, that cadaver *might* have been interred in June, but *could not* have been interred in January, would be to fly in the face of facts and to assert a proposition controverted by practical experience. Be it remembered that these remarks apply only to interred human cadavers, only to those interred in the vicinity of Washington, and only from the limited view of this field obtained from one hundred and fifty observations.

I am thoroughly convinced that we can not, as yet, make any broad, universally applicable generalizations on this subject. The field is far too broad, the important and modifying factors are far too numerous and conflicting, the conditions vary far too widely to be thus comprehended in any concise, unqualified formula. The only conclusion I can reach, as the result of my studies thus far, is that it is not safe to draw any conclusion at all. The vital point upon which the whole of Mégnin's theory of the fauna of exposed cadavers turns, is that the various insects appear in distinct "squads," at definite and specified periods of cadaveric decomposition, and that they succeed each other in regular order. That this proposition does not in any particular apply to the observations here noted is most evident from the following brief resumé of the work, taking only the more important mites, beetles and flies:

Acarina, 8 species found in 30 cases, interred from 3 years and 2 months to 71 years. Coleoptera, Pselaphidæ, 2 species found in 3 cases, interred from 16 years and 5 months to 28 years. Staphylinidæ, *Homalota*, found in 4 cases, interred from 1 year and 11 months to 10 years; *Staphylinus* found in 1 case, interred 15 years and 5 months; *Philonthus* found in one case, interred 5 years and 4 months; *Actobius* found in 22 cases, interred from 3 years and 2 months to 10 years; *Lathrobium* found in 3 cases, interred from 4 years and 4 months to 9 years and 9 months; *Pederus* found in 1 case, interred 3 years and 2 months; *Eleusis* found in 56 cases, interred from 1 year and 11 months to 11 years and 2 months. Nitidulidæ, *Rhizophagus* found in 10 cases, interred from 1 year and 11 months to 28 years. Diptera, Phoridæ, puparia found in 43 cases, interred from 3 years and 2 months to 38 years; Muscidæ, 2 species found in 5 cases, interred from 3 days to 4 years and 1 month; Anthomyidæ, *Homalomyia* found in one case, interred 2 years and 11 months; Sepsidæ, *Piophilæ* found in 13 cases, interred from 3 years and 2 months to 10 years and 3 months.

Since the completion of this paper, the writer has received a reprint of Johnston & Villeneuve's paper, "On the Medico-Legal Application of Entomology," which was "read before the Canadian Medical Association, Montreal, August, 1896," and published in the *Montreal Medical Journal*, August, 1897. These authors assert that "one may now judge from the animal fauna met with in a dead body how long it has been exposed." But they add: "The chief danger to be feared from Mégnin's imitators is that they might tend to indulge

in guesses having no very solid basis and to apply rules to countries and climates where they were inapplicable." They conclude that, "it appears certain that observations and experiments upon exposed human bodies should be made in the particular locality before the present entomological data can be directly applied to legal medicine. * * * The time limits apparently require modification for the particular locality."

It should be remembered that the experience of Johnston & Ville-neuve has been almost entirely with exposed cadavers—as distinguished from the present observations on interred cadavers. They print an interesting table, which is hereto appended.

FAUNA OF DEAD BODIES EXPOSED TO THE AIR.*
(COMPILED FROM MÉGNIN.)

	Physical Conditions.	Minimum time.	Forms met with.
First Period.....	Bodies fresh.....	{ First	(D) <i>Musca</i> .*
		{ three	<i>Cyrtoneura</i> .*
			<i>Calliphora</i> .*
Second Period.....	Decomposition com- menced	{ months.	(D) <i>Lucilia</i> .*
			<i>Sarcophaga</i> .*
Third Period.....	Fatty acids.....	{ 3 months	(C) <i>Dermestes</i> .*
		{ to	(L) <i>Aglossa</i> .
Fourth Period	Caseous products.....	{ 6 months.	(D) <i>Piophilæ</i> .*
			<i>Anthomyia</i> .
			(C) <i>Necrobia</i> (<i>Corynètes</i>).
Fifth Period.....	Ammoniacal fermenta- tion, black liquefac- tion	{ 4 months	(D) <i>Thyreophora</i> .
			<i>Ophyra</i> .*
		{ to	<i>Lonchea</i> , <i>Phora</i> .
			(C) <i>Necrophorus</i> .
			<i>Silpha</i> .*
		{ 8 months.	<i>Hister</i> .*
			<i>Saprinus</i> .*
Sixth Period	Desiccation	{ 6 months	(A) <i>Uropoda</i> .
		{ to	<i>Trachynotus</i> .
			<i>Tyroglyphus</i> .*
		{ 12 months.	<i>Glyciphagus</i> .
			<i>Serrator</i> .
Seventh Period...	" extreme.....	{ 1 year	(L) <i>Aglossa</i> .
		{ to	<i>Tineola</i> .
		{ 3 years.	(C) <i>Attagenæ</i> .
			<i>Anthrenus</i> .
Eighth Period.....	Debris	{ Over 3 years.	(C) <i>Tenebrio</i> .
			<i>Plinius</i> .

FAUNA OF BURIED BODIES.

Before Burial	(D) <i>Calliphora</i> ,* <i>Cyrtonera</i> .
After Burial	(D) <i>Ophyra</i> ,* <i>Phora</i> .
(The genera marked * in the table are those met with by ourselves.)	(C) <i>Philonthus</i> ,* <i>Rhizophagus</i> .
	(T) <i>Achorutes</i> , <i>Templetonia</i> .

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EXPLANATION OF TABLES.

TABLE I. Showing entire "find" on human cadavers buried for varying periods.

In the first column are given the serial numbers, with numbers referring to notes on individual observations. Next is indicated the duration of interment, expressed in years and months; then the month in which interment was made and that in which the body was disinterred. Then follow the depth of the grave and character of soil—"s" = sandy, "c" = clay, and "sc" = sand and clay mixed. The degree of moisture, noted in the grave at the time of disinterment, is indicated as follows: 1 = dry, 2 = moist, 3 = wet, 4 = coffin submerged. The figures in the body of the table indicate the number of the specimen or specimens, in the Stiles-Motter collection of grave-fauna, to be deposited in the U. S. National Museum. Some of these specimens, more particularly of the lower forms, have not as yet been fully determined.

* (D) Diptera, (C) Coleoptera, (L) Lepidoptera, (A) Acari, (T) Thysanura.

TABLE II.—Showing the miburied for periods varying from 2 to 5

	Do									
	2	3	12	13	14	15-20	20-30	30-40	71	
ACARINA.										
Gamasidæ, Gamasus,.....		+							+	
“ Holostaspis,		+						+		
“ Hypoaspis,		+								
“ Iphis,										
“ Uropoda,		+								
“ U. depressa,										
Tyroglyphidæ, Tyroglyphus,.....										
“ Hypopus,.....							+		+	
Orbatidæ, Hoplophora,										
COLEOPTERA.										
Pselaphidæ, Batrisus,						+	+	+		
Staphylinidæ, Homalota,			L							
“ Staphylinus,						+				
“ Philonthus,										
“ Actobius,.....										
“ Lathrobium,										
“ Pæderus,										
“ Eleusis,										
Nitidulidæ, Rhizophagus,			+			+		+		
Elateridæ, Monocrepidius, ..							L			
DIPTERA.										
Stratiomyidæ,										
Phoridæ, puparia,.....			+		+	+	+			
“ P. clavata,.....	+									
“ Conicera,.....					+		+	+	+	
Muscidæ, Compso myia,.....										
“ Lucilia,	+									
Anthomyidæ, Homalomyia,										
“ O. leucostoma, ...	+	+								
“ *Ophyra anthrax, ..										
Sepsidæ, Piophila,										
Borboridæ,										

* Reported by other observers.

TABLE II.—Showing the mites, beetles and flies found on INTERRED canine and human cadavers. Dog cadavers buried for periods varying from 2 to 5 months. Human cadavers buried for periods varying from 1 to 71 years.

	Dog.				D	M	INTERRED HUMAN CADAVERS.																		
	2	3	4	5	3	2	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15-20	20-30	30-40	71	
ACARINA.																									
Gamasidæ, Gamasus,.....	+												+											+	
“ Holostaspis,.....																	+								
“ Hypoaspis,.....	+																						+		
“ Iphis,.....																	+								
“ Uropoda,.....	+			+																					
“ U. depressa,.....									+	+	+	+	+	+											
Tyroglyphidæ, Tyroglyphus,.....									+																
“ Hypopus,.....																						+		+	
Orbatidæ, Hoplophora,.....																									
COLEOPTERA.																									
Pselaphidæ, Batrisus,.....																					+	+	+		
Staphylinidæ, Homalota,.....							+				+	+				+		L			+				
“ Staphylinus,.....																					+				
“ Philonthus,.....										+	?														
“ Actobius,.....									+	+	+	+	+	+		+									
“ Lathrobium,.....															+										
“ Pederus,.....									+							+									
“ Eleusis,.....							+		+	+	+	+	+	+	+	+	+								
Nitidulidæ, Rhizophagus,.....							+			+	+	+	+	+		+	+				+		+		
Elateridæ, Monocrepidius,.....				+					+													L			
DIPTERA.																									
Stratiomyidæ,.....									+																
Phoridæ, puparia,.....									+		+	+	+		+	+	+	+	+	+	+	+	+		
“ P. clavata,.....	+																								
“ Conicera,.....			+	+				+									+			+		+	+	+	
Muscidæ, Comptosia,.....					+				+																
“ Lucilia,.....	+				+				+																
Anthomyidæ, Homalomyia,.....					+				+																
“ O. leucostoma,.....	+	+																							
“ *Ophyra anthrax,.....						+																			
Sepsidæ, Piophilæ,.....									+		+	+	+		+	+									
Borboridæ,.....									+				+		+	+									

* Reported by other observers.

TABLE 2, groups the mites, beetles and flies, which have been held to be especially significant as time-indicators, and shows that the same species have been found after widely varying periods of interment. This is in direct contrast with the "principle" hitherto deduced, from observations on exposed cadavers, "that the products formed at different epochs in the progress of decomposition attract certain forms and repel others." A principle which Mégnin reiterates in a recent "Note sur une collection d'Insectes des cadavres intéressants à connaître au point de vue Médico-legal, offerte au Museum."

NOTES ON CERTAIN SOUTH AMERICAN COCHLIDIIDÆ AND ALLIED FAMILIES.

BY HARRISON G. DYAR.

At my request Mr. W. Schaus kindly brought me a number of moths from his collection for examination. Many of them are his types of species recently described and the rest have been carefully determined by him. The following notes are based on this material. It includes the groups closely allied to the Cochliidiidæ as well as that family itself, and one species of Ptilodontidæ, which was improperly described as a Cochliidian.

Family DALCERIDÆ.

Synopsis of Genera.

- Fore wings without accessory cell ; antennæ with prominent scale tuft at tip.
 Vein 6 arising above discal vein ; vein 11 from cell.....**Dalcera**
 Vein 6 arising below discal vein ; vein 11 stalked with 9 and 10....**Dalcerina**
 Fore wings with accessory cell ; antennæ without scale tuft.
 Veins 9 and 10 long stalked, but distinct**Acraga**
 Veins 9 and 10 coincident, 9 absent or invisible.
 Hind wings ovate, rounded.....**Dalcerides**
 Hind wings trigonate, inner margins long.....**Epipinconia**

Genus *Dalcera* H.-S.

1855—*Dalcera* HERRICH-SCHÄFFER, Ausser. Schmett. I. 7.

Type, *abrasa* H.-S.: also *fumata* Schaus, both before me. Möschler has given the generic characters. Others species listed are *obscura* Schs., *alba* Druce, *laxata* Druce, *ampla* Druce and *leberna* Druce, but I have not examined them.

Genus **Dalcerina**, nov.

Antennæ short, bipectinate, a tuft of scales at tip above; head prominent, eyes large; palpi porrect, slender, exceeding the front by half their length, not reaching vertex; third joint minute. Legs slender, hind tibiæ with end spurs only. Wings full, rounded; fore wing costa straight, rounded at apex; vein 1, furcate at base, without branch; 1 c present; 2 at middle of cell; 4 and 5 short stalked; cell closed by the short, wide angled furcation of discal vein; 6 midway between 5 and discal vein; 7 and 8 long stalked below apex of cell; 9 and 10 very long stalked as in *Dalcera*, but 11 also stalked with 9 and 10 for some distance; 12 from base; retinaculum a long fold. Hind wings with three internal veins; vein 2 from the middle of cell; 3 and 4 arising close together; 5 from the lower part of cross vein; discal vein as on fore wing; 6 and 7 very remote, running parallel; 8 very close to 7 to end of cell, but free or with a trace only of a cross bar toward base where the vein is rounded toward costa. Frenulum long.

Type *tijucana* Schaus (Proc. Zool. Soc. Lond., 1892, 322). Mr. Schaus' type is before me, and looks, superficially, like a variety of *Dalcera fumata*.

Genus **Acraga** Walk.

1855—*Acraga* WALKER, Cat. Brit. Mus. Lep. Het. IV, 807.

1882—*Pinconia* MOORE, Proc. Lit. Phil. Soc. Liverp. XXXVI, 364.

Venation as in *Dalcera* (*vide* Möschler, Verh. Zool. Bot. Ges. Wien, XXVII, 673), but accessory cell present; veins 7-8 and 9-10 on stalks from accessory cell; 11 from the top of accessory cell.

Type *ciliata* Walker; also *moorei* Dyar (|| *ochracea* Moore), *ochracea* Walk. and *coa* Schaus. Also *melinda* Druce, unknown to me. I am indebted to Sir G. F. Hampson for information about Walker's type in the British Museum.

Genus **Dalcerides** N. & D.

1893—*Dalcerides* NEUMEGEN and DYAR, Can. Ent. XXV, 121.

Close to *Acraga*, but the stalk of veins 9 and 10 reaches tip of wing.

Type *ingenita* Hy. Edw.; also *mesoa* Druce, the latter from Mr. Schaus' collection.

Genus **Epipinconia**, nov.

Antennæ short, bipectinate; eyes large; palpi slender, porrect, reaching half their length beyond the front; legs slender, hind tibiæ without spurs. Fore wing triangular, costa straight; vein 10 shortly stalked on the stalk of 7 and 8, 9 coincident (absent), 11 at base of accessory cell, all as in *Dalcerides*. Hind wings trigonate; inner margin long, anal angle sharply rounded, as also apex, the outer margin nearly straight; veins 2 to 5, somewhat equally spaced, 3 and 4 nearest; 6 above the end of discal vein, remote from and parallel to 7; 8 close to subcostal to end of cell, then divergent. Thinly scaled, bronzy, glistening species.

Type *flava* Walker (Cat. Brit. Mus., V, 1107); also *citrina* Schaus are before me.

Family MEGALOPYGIDÆ.

Genus *Aidos* Hübner.

1818—*Aidos* HÜBNER, Verz. Bek. Schmett. 191.

1895—*Brachycodion* DYAR, Can. Ent. XXVII, 244.

This has the venation of *amanda*, but veins 8 and 9 form a rounded rather than an angular furcation and 10 and 11 are very shortly stalked together. On hind wings veins 3 and 4 are shortly stalked; 6 and 7 separate and parallel; 8 free to base.

Type *amanda* Stoll; also *yamouna* Dogn. (*Euclea yamouna* Dognin, Le Nat., XIII, 126) from Mr. Schaus' collection.

Genus *Brachycodilla*, nov.

Antennæ lengthily pectinated on basal half, terminal half simple (serrate), the regions sharply marked; head sunken, palpi short, porrect, just reaching frontal tuft. Robust, vestiture suberect; legs rather long, posterior tibiæ with terminal spurs only. Venation essentially as in *Aidos* (*vide* Can. Ent., XXVII, 244), but vein 8 of hind wings is joined to subcostal by a strong bar at the end of the cell.

Type *castrensis* Schaus (Journ. N. Y. Ent. Soc., IV, 56); also *B. carmen* Schaus (*Talima carmen* Sch.) and *B. admirabilis* Schaus (*Perola admirabilis* Sch.) are before me, the latter retained in my collection by the kindness of Mr. Schaus.

Genus *Cyclara* Schaus.

1896—*Cyclara* SCHAUS, Journ. N. Y. Ent. Soc. IV, 57.

Besides the characters given by Mr. Schaus, vein 1 of fore wings has a long branch on the lower side (characteristic of the Megalopygidæ); vein 6 arises above the concavity of the cell; cell broad; stalk of veins 7 and 8 drooping from that bearing 9; hind wings with veins 6 and 7 remote and parallel; 8 touching the cell except at base and extreme apex. Antennæ much shorter than half of fore wing, but not disproportionately short as the body is slender, pectinated to the tip; eyes large; palpi very short, almost rudimentary, not reaching the front; legs slender, rather long, hind tibiæ without spurs. A fragile insect, with proportionately large rounded wings.

Type *ovata* Schaus. Mr. Schaus' type is before me.

Family COCHLIDIIDÆ.

A. Male antennæ bipectinate on basal portion, the terminal half simple.

a. Discal vein long forked, the limbs forming an angle of less than 90°.

Genus *Sibine* H. -S.

1855—*Sibine* HERRICH-SCHAEFFER, Ausser. Schmett. I, 7.

1855—|| *Nyssia* WALKER, Cat. Brit. Mus. V, 1132.

1860—*Empretia* CLEMENS, Proc. Acad. Nat. Sci. Phil. XII, 158.

1866—*Eupalia* WALKER, Cat. Brit. Mus. XXXV, 1927.

1878—*Streblota* BERG, Ann. Soc. Argent. V, 177.

1878—*Neomiresa* BUTLER, Trans. Ent. Soc. Lond. 74.

Type *nesea* Stoll. Mr. Schaus has loaned me specimens labelled *modesta* Cr., *plora* Schaus, *extensa* Schaus, and *trimacula* Stoll. I should regard the first three as the same species in most genera, but here the larvæ should be known for certainty.

Genus *Episibine*, nov.

Male antennæ bipectinated on basal third, the tip simple; palpi not reaching beyond the frontal hairs; fore wings with costa straight, inner margin sinuate, veins 2, and 3 separate, 8 and 9 stalked, 11 straight; fork of discal vein long and closed by a cross-vein; hind wings triangular, veins 6 and 7 separate at base, but divergent; 8 anastomosing at base; hind tibiæ without perceptible spurs.

Type *auromacula* Schaus (Journ. N. Y. Ent. Soc., IV, 56). Mr. Schaus' type is before me. This is a specialization of the ordinary *Sibine* form, the hind wings shaped as in the male of *Phobetron*.

Genus *Euclea* Hübner.

1822—*Euclea* HÜBNER, Verz. Bek. Schmett. 149.

1854—*Neura* HERRICH-SCHÄFFER, Samml. Ausser. Schmett. I, fig. 176.

1859—*Parasa* MOORE, Cat. Lep. E. I. Co. 413.

1860—*Nochelia* CLEMENS, Proc. Acad. Nat. Sci. Phil. XII, 159.

1864—*Callochloa* PACKARD, Proc. Ent. Soc. Phil. III, 339.

Type *cippus* Cramer.

♂ 1. Fore wings with vein 10 from end of cell (*Parasa*).

E. imitata Druce ♂, kindly added to my collection by Mr. Schaus.

E. cebrenis Sch. ♂ ♀, (♀ *Trabala cebrenis*). The female has been described by Mr. Schaus and figured by H. Druce (Biol. Cent.-Am., Lep. Het., II, pl. 87, fig. 11). The male associated with it is *E. lysia* Druce (Biol. Cent.-Am., II, 439) without any green on the fore wings. Mr. Schaus stated to me that he had a reason for this unexpected association, but he could not then recall what it was.

E. minima Schaus.

♂, Identical with *chloris* H.-S., except that the green band is of about half the width and does not touch the base of the wing. The moth is a little smaller than is usual in *chloris*.

E. viridogrisea, sp. nov.

Vertex of head and thorax above bright green; abdomen, thorax below and legs dark slate gray; wings uniformly dark slate gray, the veins not lined; on fore-

wings a rather narrow bright green band crosses the wing at about the middle and runs along internal margin to base; it is edged on both sides narrowly with light red brown; width of band about one-fourth the length of wing, a little narrower centrally from the brown outer border becoming broader at that point; the terminal space is slightly grizzled by pale scales. Expanse, 32 mm.

Type, one female in the collection of Mr. Schaus, who says that this is the "*chloris*" of the *Biologia Centrali-Americana*.

♂ 2. Fore wing with vein 10 stalked (*Eulea*).

E. diversa Druce. (*Semyra diversa* D.)

The figure in the *Biologia* is poor. The silvery line near internal margin should be a slender zigzag, produced a little along vein 2 and narrowly along vein 1 to base. The ordinary green of the genus is here replaced by dark brown. The pretty species seems to suggest some affinity with *Monoleuca* in markings.

E. copac Schaus. (*Neomiresa copac* Sch.)

A pretty dark gray species, with ovate, rounded wings.

Genus **Metraga** Walk.

1855—*Metraga* WALKER, Cat. Brit. Mus. V, 1129.

Type *perplexa* Walk. This species is before me. The genus seems a good one, close to *Eulea*, but differing in the large palpi, which reach nearly to the vertex of head, and in the convex costa; vein 11 is distinctly curved toward vein 12 at base; the discal vein is long forked and the cell closed by a cross-vein.

Genus **Miresa** Walk.

1855—*Miresa* WALKER, Cat. Brit. Mus. V, 1123.

Type *albipuncta* H.-S. In this genus the discal vein is long-forked, the limbs connected by a cross-vein outwardly; but often the upper limb is weak, so that the cross-vein practically replaces it, and the deceptive appearance of Hampson's figure is produced (*Moths of India*, I, 386).

M. argentea Druce. (*Eupalia argentea* D.)

The upper limb of the discal fork is quite strong and distinct; the palpi are a little longer than normal, just exceeding the front, and the pectinations of antennæ are not sharply marked off from the simple portion, the serrations running to apex. This is a generalized species in all these characters, possibly separable generically from *Miresa* (it would fall in *Asteria* Feld).

M. argentata Walk. (*Nyssia argentata* Walk.)

A true *Miresa*, close to the Indian species *bracteata* Butl., *argentifera* Walk., and *nivaha* Moore. The upper limb of discal fork is nearly absent, just traceable as a slight fold.

Genus **Idonauton** *Swinhoe*.

1892—*Idonauton* HAMPSON, Moths of India, I, 391.

Type *apicale* Walker.

I. straminea *Schaus*. (*Semyra straminea* Sch.)

This may be referred here provisionally. I have no male, hence do not like to propose a new genus. The palpi agree with *Idonauton*; head sunken, front not tufted; hind legs with terminal spurs only; venation agreeing with Hampson's figure, vein 10 from end of cell, but discal vein forked and closed by a cross vein.

b. Discal vein short-forked, the limbs forming an angle of 90° or more.

Genus **Talima** *Walk*.

1855—*Talima* WALKER, Cat. Brit. Mus. V, 1120.

Type *postica* Walker. The type species is before me. Venation of *Parasa*, except for the short forked discal vein, of which the two limbs close the cell, widely divergent, looking like a single vein meeting the end of cell. Vein 11 slightly curved at base. The palpi are upturned nearly to vertex; hind tibiae with end spurs only. A thinly scaled, simply marked form, more generalized than the preceding.

Genus **Protalima**, nov.

Closely allied to *Talima*, but the palpi are short, not exceeding the frontal tuft, and the inner margin of hind wings is rounded, less long drawn out than in *Talima*. This would fall in *Miresa*, except for the structure of the discal vein. The superficial appearance, however, is like *Talima*, and is here really the best guide to affinity. Type *sulla* Schaus (*Nyssia sulla* Sch., Proc. Zool. Soc. Lond., 1892, 324).

B. Male antennae bipectinated to the tip; fork and discal vein short and open.

a. Palpi long, reaching near or above vertex.

* Veins 2 and 3 of fore wings separate.

Genus **Vipsania** *Druce*.

1887—*Vipsania* DRUCE, Biol. Cent.-Am. Lep. Het. I, 217.

Palpi as in *Hyphorma*; fore wings with veins 7-9 stalked; fork of discal vein short and open, but a peculiar deceptive fold lies from the middle of the vein to origin of vein 6; hind wing like *Hyphorma*, but discal vein not forked; veins 6 and 7 from a point. Hind legs broken; but I learn from Sir G. F. Hampson that Druce's

type has two pair of spurs. The male is needed to place this genus finally ; compare section C.

Type *anticlea* Druce ♀. Only the female is known and Mr. Schaus' specimen is one of this sex. Consequently the male antennæ are unknown.

Genus **Semyra** Walker.

1855—*Semyra* WALKER, Cat. Brit. Mus. V, 1130.

1878—*Eulimacodes* MÖSCHLER, Verh. Zool.-Bot. Ges. XXVII, 672.

Type *coarctata* Walk. The type species is before me ; also Mr. Schaus' type specimen of *Eulimacodes möschleri*, which is simply the female of *coarctata* Walk. *S. distincta* Möschl., with the same structure and pattern, but larger and *S. bella* H.-S. are also before me. *S. cardia* Schaus begins to depart a little from the generic type. The palpi are a little shorter, not quite attaining the vertex, about as in *Prosternidia* Saalm., with which this species might be confounded in a synoptic table, though the markings are as in *Semyra*.

Genus **Prosternidia** Saalm.

1884—*Prosternidia* SAALMÜLLER, Lep. Madagascar, I, 208.

Type *metallica* Saalm. I have not seen this type, but from the characters given, place in the genus provisionally *P. elæa* Druce (*Perola elæa* D.), which is before me.

* * Veins 2 and 3 of fore wings stalked.

Genus **Amydona** Walk.

1855—*Amydona* WALKER, Cat. Brit. Mus. V, 1110.

Type *subpunctata* Walk. Mr. Schaus has kindly given me *Perola dora* Druce, which he thinks is the same as *subpunctata* Walk. The forks of discal vein form a right angle, or a trifle less ; open. Congeneric are *A. sucia* Schaus (*Perola sucia* Sch.) and *A. platona* Schaus.

Amydona sericea Schaus.

This does not belong here, but I cannot place it, as the hind legs are gone. It is a curiously contradictory form, the male antennæ being distinctly pectinated to the tip, though decreasing rapidly on terminal half, while the fork of discal vein is long and closed by a cross-vein. The palpi are upturned above vertex, third joint long and slender ; head rather prominent. Venation normal, vein 1 with many small veinlets toward the margin, but no distinct branch ; veins 2 and 3 widely separate, 7 to 9 stalked, 11 oblique ; hind wings with

6 and 7 from a point, 8 anastomosing near base. Mr. Schaus' type is before me. This doubtless represents a new genus.

b. Palpi moderate, reaching beyond frontal tuft.

* Veins 2 and 3 of fore wings separate.

Genus *Natada* Walk.

1855—*Natada* WALKER, Cat. Brit. Mus. V, 1108.

Type *rufescens* Walk. *Perola daona* Druce is before me. It belongs to this genus and seems specifically identical with *N. nasoni* of the United States.

Genus *Sisyrosea* Grote.

1876—*Sisyrosea* GROTE, Can. Ent. VIII, 112.

Type *textula* H.-S. *Amydona lucens* Walk. is before me. The legs are broken, but the other characters agree exactly. *Semyra diana* Druce is similarly mutilated, but otherwise falls here.

Genus *Thosea* Walk.

1855—*Thosea* WALKER, Cat. Brit. Mus. V, 1068.

Type *unifascia* Walk. *T. fusca* Druce is before me (*Trabala fusca* D.) and falls here, agreeing with the characters given in Hampson's "Moths of India."

* * Veins 2 and 3 of fore wings stalked.

Genus *Epiperola*, nov.

Male antennæ bipectinated to the tip; palpi upturned, slightly exceeding the front, third joint small but distinct; fore wings with costa straight, veins 2 and 3 stalked, 7 to 9 stalked, 11 straight; fork of discal vein short and open; hind wings with veins 6 and 7 from a point, 8 anastomosing near base; hind tibiae with terminal spurs.

Type *drucei* Schaus. (Proc. Zool. Soc. Lond., 1892, 323.)

This differs from *Perola* in lacking the middle spurs of hind tibiae and in length of palpi.

c. Palpi short, not exceeding frontal tuft.

* Veins 2 and 3 of fore wings stalked.

Genus *Perola* Walk.

1855—*Perola* WALKER, Cat. Brit. Mus. IV, 920.

1855—*Romosa* WALKER, Cat. Brit. Mus. V, 1114.

1855—*Camila* WALKER, Cat. Brit. Mus. V, 1126.

Type *murina* Walk. The type species is before me. Also *P. villosipes* Walk. (*Trabala villosipes* Walk.), *sericea* Möschl. (*Asbolia seri-*

cea Möschl.), *cicur* Sch., *druceoides* Dogn., *brumalis* Sch. and *rubens* Sch., all before me. I am indebted to Sir G. F. Hampson for the structural characters of the genera referred to the synonymy.

Genus **Paleophobetron**, nov.

Male antennæ bipectinated to the tip; palpi porrect, just reaching the front; fore wings with costa straight, veins 2 and 3 stalked, 11 straight, fork of discal vein broadly open without cross-vein; hind wings triangular, veins 6 and 7 stalked, 8 anastomosing at base; hind tibiæ with small terminal spurs.

Type *arcuata* Druce (Biol. Cent.-Am. Lep. Het., II, 444, pl. 88, fig. 9).

This differs from *Perola* in lacking the middle spurs of hind tibiæ and in wing shape.

C. Male antennæ simple.

a. Veins 6 and 7 of hind wings from a point or stalked.

Genus **Pseudovipsania**, nov.

Male antennæ simple; palpi porrect, three times as long as the head, third joint distinct, quadrate; fore wings with costa straight, veins 2 and 3 separate, 7 to 9 stalked, 11 very slightly curved toward 12 at base, fork of discal vein short and open; hind wing with veins 6 and 7 stalked, 8 anastomosing at base; hind tibiæ with terminal spurs, the legs weaker than the middle pair which are apparently abnormally strengthened.

Type *frigida* Schaus (Proc. Zool. Soc. Lond., 1892, 323).

Genus **Prolimacodes** Schaus.

1896—*Prolimacodes* SCHAUUS, Journ. N. Y. Ent. Soc. IV, 56.

Type *triangulifera* Schaus. Mr. Schaus has given me a specimen of the typical species. The structure is as in the North American *scapha*, except that vein 10 of fore wings is from cell and 6 and 7 of hind wings from a point. It is a form a little more generalized than our species, but, I think, not generically distinct therefrom.

Family PTILODONTIDÆ.

Trabala truncata Schaus.

Belongs to this family (Melalophidæ). In the synoptic table it falls with *Harpyia*, but the tongue is imperceptible and the wings are shorter and more triangular. The palpi are scarcely curved, and exceed the front by half their length; third joint small. I do not yet know enough of the South American Ptilodontid genera to place this form.

THREE NEW SPECIES OF SESIIDÆ.

BY WILLIAM BEUTENMÜLLER.

Sesia tacoma, sp. nov.

Male: Head deep black, palpi yellow above and clothed with long black and yellow hair beneath. Collar narrowly yellow in front. Thorax deep black with a narrow yellow stripe on the patagiæ and a narrow, yellow, transverse mark at the posterior end. Abdomen deep black with a narrow yellow band at the end of the second, fourth and sixth segments. Anal tuft black, fan-like and mixed with a little yellow beneath at the middle. Thorax beneath with a large yellow patch on each side. Femora black with loose scales; tibiæ banded with yellow; tarsi yellow. Anterior coxæ with a yellow line. Fore wings transparent, brown-black at margins and on the veins; space between median vein and inner margin orange-red, also orange-red between the veins on the outer part of wings and border of the cell. Transverse mark large, black and touched with orange-red on each side. Transparent part beyond this mark rounded; elongate and triangular in cell. Fringes brown. Hind wings wholly transparent and narrowly bordered with violet black; fringes brown. Antennæ black. Fore wings beneath largely orange-red except borders and the transverse mark which is much reduced. Hind wing like above, but with an orange line in outer border. Expanse, 19-21 mm.

Female: Head, thorax, legs and abdomen as in the male, but the abdomen is heavier with the bands somewhat broader. Palpi wholly yellow. Fore wings with the orange-red and heavier, giving them a red appearance with narrow black margins. Hind wings with a narrow red margin before the brown fringes. Underside almost entirely golden orange-red and narrowly bordered with brown-black outwardly and the fringes. Transverse mark red, sometimes with a black center. Hind wings beneath similar to the above. Abdomen beneath with three bands at end. Anal tuft black, a little yellow beneath. Expanse, 20-22 mm.

Habitat: 1 ♂, Big Horn Mts., Wyoming, July 11, 1896 (R. P. Currie), Type, U. S. National Museum; 3 ♂, 6 ♀, Mt. Ranier, 6,300 feet, Washington State, August, on *Veratrum viride* (C. V. Piper).

Sesia arizonæ, sp. nov.

Head brown black; collar canary yellow in front; palpi wholly canary yellow. Thorax brown-black with a narrow yellow line on the patagiæ. Abdomen blue black; first segment yellow and with a yellow band at the ends of the 3-7 segments, inclusive, those on the third, fifth and seventh segments twice as broad as the others. Anal tuft largely yellow, black at the sides and beneath. Thorax beneath with a large yellow patch on each side. Abdomen beneath with the bands repeated or only partly repeated. Femora blue-black; tibiæ banded with yellow, tarsi wholly yellow as are also the anterior coxæ. Fore wings violet brown, with the usual transparent spaces, wholly or partly filled with golden-orange and only slightly transparent beyond the golden-orange transverse mark, also streaked with this color between the

veins on the outer part of the wings. Hind wings transparent, fringes fuscous, narrowly orange at base. Underside of fore wings golden-orange with the veins on outer part violet. Hind wings beneath same as above. Antennæ black. Expanse, 22 mm.

1 ♀, Summit of Mt. Union, 9,000 feet, Arizona, July 3, 1887, flying about scrub oak (G. D. Hulst). Coll. Hy. Edwards.

1 ♀, Texas. Coll. U. S. Nat. Mus.

***Pyrrophætania coccinea*, sp. nov.**

Head black; palpi yellow, tip black; collar narrowly edged with white in front. Thorax and abdomen bronzy-black with a metallic reflection. Antennæ brown-black. Underside of thorax with a scarlet patch on each side. Legs metallic blue-black. Fore wings bright scarlet-red, outer border and a round spot at end of cell bronzy-brown. Hind wings brown. Underside of fore wings light orange, outer part brown, discal spot much reduced. Hind wings beneath same as above. Expanse, 12 mm.

1 ♀, Albuquerque, New Mexico. (Cockerell.) Type, Coll. U. S. Nat. Mus.

Very different from any of the hitherto known species. It may be at once recognized by the bright red fore wings with brown outer border and discal spot.

THE LIFE-HISTORIES OF THE NEW YORK SLUG CATERPILLARS.—XVII.

PLATE XI, FIGS. I-12.

BY HARRISON G. DYAR, A.M., PH.D.

***Heterogenea shurtleffii* Packard.**

1864—*Heterogenea shurtleffii* PACKARD, Proc. Ent. Soc. Phil. III, 346.

1882—*Heterogenea shurtleffii* GROTE, Check List. p. 18.

1891—*Heterogenea shurtleffii* and var. *cæsonia* SMITH, List Lep. p. 29.

1892—*Heterogenea shurtleffii* KIRBY, Cat. Lep. Het. I, 556.

1894—*Heterogenea cæsonia*? NEUMEGER & DYAR, J. N. Y. Ent. Soc. II, 74.

SPECIAL STRUCTURAL CHARACTERS.

Dorsal space rather narrow and of uniform width, narrowing a little posteriorly, but scarcely so anteriorly; full, rounded, not concave. Sides obliquely concave; subventral space small, retracted. Ridges at first prominent, with large, low, distinct segmentary tubercles; later the subdorsal ridge indicated by the change in direction between

back and sides, lateral one projecting, smooth, neither ever spinose. Setæ of stage I, as in *Tortricidia pallida*, differing only in detail. Later the warts are represented by distinct short setæ which diminish nearly to obliteration during ontogeny. Depressed spaces well developed, fairly large, (1) to (8) present. Skin at first smooth, later covered with round, clear granules, each with a minute central spine and crown of four to eight around it, causing the skin to appear minutely furry. The granules appear well formed first on the ridges, later spreading more evenly over the body. The fur-like spines become smaller at each subsequent molt till in the last stage they are absent, leaving the granules perfectly smooth. Coloration green with yellow lines and a small red mark. There are six larval stages.

AFFINITIES, HABITS, ETC.*

Allied to *Tortricidia pallida* and *Heterogenea flexuosa*. Stage I is most like *flexuosa*, but the Y-shaped setæ are distinctly alternating, as in *pallida*, or more so, and there is a brown cervical shield. In stage II the setæ persist as in *pallida*, but the granulation is at once distinguished from either by the peculiar fur on the ridges, which passes less perfectly into the spaces. The ridges are prominent and distinctly segmentarily beaded as in neither of the allies. Later, owing to the diminution of the fur and the small size of the red mark, the larva resembles most *flexuosa*, and may be distinguished from some forms of that species only by the yellow collar. It is less strongly pigmented, a clearer, less yellowish-green, while the pattern of coloration is much less extended, though essentially the same as in both allies. The transverse yellow line on joint 3, or collar, is present in this species only. The depressed spaces are yellow, as in *flexuosa*.

The moths emerge somewhat later than those of the allied species, during the first weeks in July. The larvæ have the same habits and occur in the same situations as *flexuosa*, but show a more marked pref-

* The nearest ally of our *H. shurtleeffi* will doubtless prove to be the European *H. cruciata*. The moths are strictly congeneric, whereas *H. flexuosa* and its variety *cæsonia* do not belong to *Heterogenea* or to *Lithacodes*, but properly to *Tortricidia*. *H. shurtleeffi* has been very rare in collections, only the type being known for thirty-four years. Consequently it appeared to Mr. Neumœgen and myself that it might prove an aberrant form of *cæsonia*. However we overlooked two important structural characters, not having the type for examination; but this has recently been sent to me by Mr. Henshaw. It agrees with my bred specimens, of which a full account is presented herewith. The specimens are deposited in the U. S. National Museum.

erence for large trees. I have found them rarely in Van Courtlandt Park, New York, and in several places on Long Island, most numerous at South-haven and Speonk. Mr. Joutel has found them at Glendale, but on small trees, as he tells me. This species is distinctly a local one, and when once found, a number of larvæ can be secured. I have encountered a colony in the District of Columbia on some iron wood trees growing on the shores of Rock Creek and overhanging the water. The situation is such that any other of our Eucleids could not live there, as they would fall in the water and be drowned at pupating time.

The larval stages are passed with unusual rapidity. Mature larvæ are first seen early in August, and but few last into September. With the exception of *Kronæa minuta*, this is our smallest Eucleid larva.

CRITICISM OF PREVIOUS DESCRIPTIONS.

This larva has not been described, yet a specimen was seen by us before writing the synoptic table (Journ. N. Y. Ent. Soc., III, 146), and confused there with *Heterogenea flexuosa*.* Only the last five words of the diagnosis were written actually from a specimen of *flexuosa*; the other words apply to the species, although not indicating the best specific differences. A corrected synoptic table will be given at the end of these articles.

DESCRIPTION OF THE SEVERAL STAGES IN DETAIL.

Egg.—Very small; elliptical, flat, shining, slightly milky and iridescent. Reticulations obscure, linear, elongated and irregularly quadrangular, not peculiar; size .8 x .5 mm., rarely 1.0 x .6 mm.

Stage I.—Highest in front at first, later higher in the middle and more rounded, truncate before, tail rounded. Spines as in *T. pallida*, but smaller, distinctly alternating, the Y-shaped spines of joints 5, 7, 9 and 11 leaning out sometimes so much so that those of joints 7 and 9 lean at 90° and those of joints 5 and 11 at 45° with the erect ones on the strong segments. The anterior limb of the Y-spines has a tendency to be shorter, especially on the weak segments, where, as on joint 11, it may be scarcely more than half as long as the other and lack the cleft tip. Tips bifid or trifid, brown, narrowed just before

* In the long series of bred *flexuosa-cæsonia* from the collection of the late Mr S. L. Elliot, occurs a single specimen of *shurtleffii*, showing that he, too, had confused the larvæ.

the apex, the shaft of the spine pale. Color whitish, no marks except a large brown cervical shield. Head pale, eye black, mouth brown. Skin smooth as usual. Length .8–1.2 mm. Duration of the stage seven days.

Stage II.—Elongate elliptical, joint 3 truncate before, tail broadly square, scarcely notched at the sides. Dorsum and sides moderate, not distinctly concave, nearly flat. Subdorsal ridge segmentarily tubercular with large, low, round tubercles, bearing two short, black setæ, alternating, the tubercles of joints 5, 7 and 9 a little tipped outward. Lateral ridge not tubercular, gently waved segmentarily. Both ridges broadly covered with nearly contiguous granules, produced with pale slender spines, several from a granule; on the apices of the tubercles and edge of the lateral ridge these spines are usually dark and distinctly seen, under a high power, to be arranged in the form of a radiating crown of 4 to 6 around an erect central spine (Plate XI, Fig. 5). Dorsal and lateral spaces centrally nearly smooth, the granules feebly developed. Depressed spaces indicated, slightly sunken, not fully differentiated and protected between the setose ridges. Color whitish, faintly tinged with green; dorsum darker from the food showing by transparency. Length, 1.2–1.9 mm.

Stage III.—Elliptical, not much elongated, tail rounded, quadrate, distinctly notched at the sides. Dorsum slightly, lateral space distinctly concave, subventral space very small and retracted. Subdorsal ridge prominent, segmentarily beaded tubercular. Both ridges with short, distinct black primary setæ. Depressed spaces rather large and distinct, especially (1) and (4), the other small ones visible in a good light, none very sharply edged. Skin granules large on the tubercles, bearing a crown of minute black spines, losing these and grading off into smaller granules on the latticed ridges. The paler spines on these ridges may be seen in favorable lights to overhang the edges of the depressed spaces like minute fur. Lateral ridge weakly segmentarily waved with single setæ at the projections. The latticed ridges are broad, several granules wide, the depressed spaces finely granular in the bottom. Color frosted whitish, opaque, no marks; later all faintly bluish-green from the blood, still without marks; still later a narrow yellow subdorsal line appears in a series of dots on joints 4 to 10, free, or connected by a short bar on joint 8, either yellow or pinkish red. The brown rosette spines on the ridge give a shade along all the ridges and joining at the ends. Length, 1.8–2.8 mm.

Stage IV.—Elliptical, tail rounded quadrate, in general as *T. pallida*; ridges, especially the sub-dorsal, slightly segmentarily waved. Depressed spaces deep, well marked with perpendicular sides. Skin on the latticed ridges shortly, finely, densely white pubescent with minute colorless fur arising in a crown from each small granule. On the ridges the fur is usually dark, but it may be pale and concolorous with the rest. Granules nearly uniform on all the latticed ridges, which are at least four granules wide. Depressed spaces (1) to (8) present, (7) and (8) partly confluent obliquely. Color light yellowish-green, sparsely pigmented in patches dorsally and in the upper half of lateral space, the ridges clearer. A narrow wavy yellow sub-dorsal line on joints 4 to 13, often appearing double at a certain angle by the refraction of the distinct clear ridge, the pair connected by a narrow crimson bridge on joint 8, varying in different examples. A faint yellow or salmon colored transverse band on the anterior edge of joint 3, shaded dusky by the dark rosette spines. Sides paler green, depressed spaces darker, without colored centers. Head green, width about .5 mm. Length, 2.6–4.0 mm.

Stage V.—Elliptical, tail rounded, slightly notched at the sides; dorsal space about half as broad as the lateral one, flat; lateral space steep above, slightly concave; subventral small, retracted; the larva is therefore flattened. Subdorsal ridge indicated by the angular change in direction between back and sides; lateral ridge prominent. Depressed spaces fairly large, distinct. Latticed ridges rounded, the sides not always perpendicular. The skin looks smooth, minutely granular, even shining a little; but under a high power the 4 to 6 rosette spines are still seen on the granules, very short and pale. The granules are small, rounded, not quite contiguous, uniform all over, the narrowest latticed ridge four granules wide. The rosette spines are dusky on the anterior edge of joint 3. Color bright yellow green, rather translucent on the edges. The yellow subdorsal lines extend from joint 3 posteriorly to joint 13 anteriorly, narrowed at the addorsal depressed spaces, slender, not reaching the extremities. A yellow band on joint 3 anteriorly, shaded with crimson below. Depressed space (4) yellow in the base with a green center. Subdorsal lines free at the ends, a yellow bridge centrally, varying in different examples. It may become broad, covering joints 7–9, containing a round red spot on joints 7–8, scarcely even widening the subdorsal line. Length, 3.8–5.7 mm.

Stage VI.—Shape as described. Absolutely smooth, finely clear granular, the granules low, rounded, contiguous, but not appressed, without a trace of the rosette spines. Depressed spaces rather small, but sharp, the latticed ridges not less than five granules wide. Spaces very finely granular in the bottom; (1) flat before, with green glangular center, (2) rounded, highest in the center, (4) elongate. Pale yellowish-green, shading to nearly colorless on the lateral ridge, the dorsum and upper part of lateral area on joints 6 to 11 distinctly spotted with emerald green pigment. A narrow yellow sub-dorsal line, straight, but slightly crinkly edged, on joints 4 to 13, the pair free and uniform (Plate XI, Fig. 10), or partly or wholly connected by a yellow bridge, usually with a small red spot (Plate XI, Fig. 8), or rarely a rather large one covering joints 7 and 9 and widened on joint 8 (Plate XI, Fig. 9). The red spot varies in color from vermilion red to light blue or dark slaty blue, edged with crimson. On joint 3 in front, a transverse yellow line, edged with crimson below. A series of red spots usually appears, beginning on the collar in front and extending to joint 5, not discoloring the dorsal depressed spaces. The spots are dull and diffuse. At the end of the stage the pigment is all dissolved and the larva appears entirely transparent, dirty whitish or waxy greenish, the internal organs visible in motion. It eats for only a short time in this condition, and leaves the twig to spin. Length, 4.8–8.2 mm., in some large larvæ suddenly increased to 13.3 mm. at the end of the stage by the degenerative change in shape accompanying the loss of the pigment.

Cocoon as usual, elliptical, very small. The larvæ do not leave the tree, but spin in the crevices of the bark.

Food plants. Black oak, chestnut, beech, iron wood.

EXPLANATION OF PLATE XI.

- Fig. 1. Larva, stage I, side view enlarged.
“ 2. Two of the Y shaped setæ more enlarged.
“ 3. Young larva, stage III, dorsal view.
“ 4. A section of the skin granules, back and sides, stage III more enlarged.
“ 5. A single skin granule with rosette spines, top and side views.
“ 6. Mature larva, front view.
“ 7. The same side view.
“ 8. The same, dorsal view, the usual colorational form.
“ 9. The same, showing the largest red spot seen.
“ 10. The same, showing the absence of the red spot.
“ 11. Moth of *Heterogenea shurtleffii* ♂, suffused form.
“ 12. The same, ♀, normal form.

LIST OF ARANEÆ TAKEN IN FRANCONIA, NEW HAMPSHIRE.

BY ANNIE TRUMBULL SLOSSON.

These spiders, taken by me during the last five years in Franconia, have all been examined and identified by Mr. Nathan Banks. There are 147 species in the list:

DRASSIDÆ.

<i>Micaria montana</i> Em.	<i>Drassus neglectus</i> Keys.
<i>Micaria formicoides</i> Bks.	<i>Prosthesima atra</i> Htz.
<i>Graphosa conspersa</i> Thor.	<i>Prosthesima ecclesiastica</i> Htz.
<i>Graphosa brumalis</i> Thor.	<i>Pythonissa imbecilla</i> Keys.
<i>Graphosa parvula</i> Bks.	<i>Pœcilochroa montana</i> Em.

CLUBIONIDÆ.

<i>Clubiona canadensis</i> Em.	<i>Thargalia pinnata</i> Em.
<i>Clubiona abbotti</i> Koch.	<i>Agroeca pratensis</i> Em.
<i>Clubiona riparia</i> Koch.	<i>Phrurolithus pugnatus</i> Em.
<i>Clubiona crassipalpis</i> Em.	<i>Phrurolithus alarius</i> Htz.
<i>Thargalia bivittata</i> Keys.	

AGALENIDÆ.

<i>Agalena nævea</i> Htz.	<i>Cicurina creber</i> Bks.
<i>Tegenaria derhami</i> Scop.	<i>Hahnia agilis</i> Keys.

DICTYNIDÆ.

<i>Dictyna sublata</i> Htz.	<i>Dictyna volucripes</i> Keys.
<i>Dictyna frondea</i> Em.	<i>Dictyna foliacea</i> Htz.
<i>Dictyna maxima</i> Bks.	<i>Amaurobius ferox</i> Koch.

THERIDIDÆ.

<i>Theridium tepidariorum</i> Koch.	<i>Tmeticus</i> , n. sp.?
<i>Theridium differens</i> Em.	<i>Erigone persimilis</i> Cambr.
<i>Theridium sexpunctatum</i> Em.	<i>Linyphia mandibulata</i> Em.
<i>Theridium rupicola</i> Em.	<i>Linyphia communis</i> Htz.
<i>Steatoda borealis</i> Htz.	<i>Linyphia marginata</i> Koch.
<i>Steatoda marmorata</i> Htz.	<i>Linyphia phrygiana</i> Koch.
<i>Lithyphantes corollatus</i> Linn.	<i>Linyphia variabilis</i> Bks.
<i>Euryopsis funebris</i> Htz.	<i>Lepthyphantes minuta</i> Blk.
<i>Diopœna nigra</i> Em.	<i>Lepthyphantes nebulosus</i> Sund.
<i>Argyrodes trigonum</i> Htz.	<i>Helophora insignis</i> Blk.
<i>Ceratinella minuta</i> Em.	<i>Drapetisca socialis</i> Blk.
<i>Ceratinella fissiceps</i> Cambr.	<i>Diplostyla nigrina</i> Reuss.
<i>Ceratinella micropalpus</i> Em.	<i>Bathypantes zebra</i> Em.

Ceratinella emertoni *Cambr.*
Ceratinella pygmæa *Em.*
Ceratinopsis nigriceps *Em.*
Cornicularia directa *Cambr.*
Lophocarenum florens *Cambr.*
Tmeticus plumosus *Em.*

Bathyphantes alpina *Em.*
Bathyphantes bihamata *Em.*
Micronecta 5-dentata *Em.*
Micronecta olivacea *Em. ?*
Micronecta discolor *Em.*

EPEIRIDÆ.

Epeira solitaria *Em.*
Epeira corticaria *Em.*
Epeira cavatica *Keys.*
Epeira nordmanni *Thor.*
Epeira silvatica *Em.*
Epeira scolopetaria *Clerck.*
Epeira patagiata *Koch.*
Epeira strix *Htz.*
Epeira trifolium *Htz.*
Epeira insularis *Htz.*
Epeira trivittata *Keys.*
Epeira pratensis *Em.*
Epeira displicata *Htz.*
Epeira prompta *Htz.*
Epeira placida *Htz.*

Epeira gibberosa *Htz.*
Plectana stellata *Htz.*
Singa variabilis *Em.*
Singa maculata *Em.*
Cyclosa conica *Pall.*
Zilla montana *Koch.*
Cercidia prominens *West.*
Argiops transversus *Em.*
Larinia borealis *Bks.*
Meta menardi *Latr.*
Theridosoma gemmosum *Koch.*
Pachygnatha brevis *Em.*
Tetragnatha grallator *Htz.*
Tetragnatha extensa *Linn.*

THOMISIDÆ.

Xysticus stomachosus *Keys.*
Xysticus emertoni *Keys.*
Xysticus elegans *Keys.*
Xysticus limbatus *Keys.*
Xysticus 4-lineatus *Keys.*
Xysticus galosus *Keys.*
Xysticus triguttulus *Keys.*
Xysticus gramineus *Em.*
Xysticus formosus *Bks.*

Coriachne versicolor *Keys.*
Oxyptila conspurcata *Thor.*
Synæna obscura *Keys.*
Misumena vatia *Clerck.*
Tmarsus caudatus *Htz.*
Tibellus oblongus *Walck.*
Thanatus rubicundus *Keys.*
Philodromus rufus *Walck.*
Philodromus vulgaris *Htz.*

LYCOSIDÆ.

Lycosa pratensis *Em.*
Lycosa frondicola *Em.*
Lycosa erratica *Htz.*
Lycosa carolinensis *Htz.*
Pardosa montana *Em.*
Pardosa pallida *Em.*
Pardosa nigripalpis *Em.*
Pardosa brunnea *Em.*
Pirata minuta *Em.*

Pirata insularis *Em.*
Pirata montana *Em.*
Pirata, n.sp.?
Trochosa rubicunda *Keys.*
Ocyale undata *Htz.*
Dolomedes tenebrosus *Htz.*
Dolomedes scriptus *Htz.*
Dolomedes sexpunctatus *Htz.*

ATTIDÆ.

<i>Phidippus rufus</i> Htz.	<i>Habrocestum decorum</i> Blk.
<i>Phidippus mystaceus</i> Htz.	<i>Habrocestum borealis</i> Bks.
<i>Phidippus borealis</i> Bks.	<i>Habrocestum cristatum</i> Htz.
<i>Philæus militaris</i> Htz.	<i>Ergane borealis</i> Blk.
<i>Dendryphantes octavus</i> Htz.	<i>Saitis pulex</i> Htz.
<i>Icius elegans</i> Htz.	<i>Attus palustris</i> Peck.
<i>Icius similis</i> Bks.	<i>Attus cruciatus</i> Em.
<i>Neon nellii</i> Peck.	<i>Zygoballus iridescens</i> Bks.
<i>Habrocestum coccatum</i> Htz.	

DESCRIPTIONS OF SOME LEPIDOPTEROUS LARVÆ.

By D. W. COQUILLETT.

Nola miniuscula Zell.

Body light bluish-green or light gray, on each of the segments four to eleven is a transverse row of four very large brownish warts, which are thinly covered with short whitish hairs, while below the lowest of each, and on 1, 2, 3 and 12 segments is a smaller greenish or gray wart thinly covered with longer white hairs; a subdorsal wavy black line on anterior part of body, sometimes extending nearly the entire length of the body; head small, wholly contractile in the first segment, light brownish, a black dot on each side, spiracles wholly brown; fourteen legs, none under segment six. Length, 12 mm.

Found one June 9th and three June 11th, 1886, feeding upon a Tenthridinid gall on willow; they feed upon them from the outside. Two spun whitish, elongate-ovate, tough cocoons June 12. The date of the issuing of the moths was not noted.

Scepsis wrightii Grote.

A caterpillar pupated December 14, 1889, and the moth issued February 11 of the following year. The chrysalis is pale yellowish, marked with a dorsal, lateral and ventral broad black interrupted band and a subdorsal row of black dots. Another caterpillar pupated February 18, 1890, and the moth issued March 21, of the same year.

Arctia nevadensis Grote.

Body black, with a purplish tinge, the portion below the spiracle lighter, more grayish ; a broken dull white dorsal line ; warts light gray, hairs issuing from them in spreading clusters not concealing the ground color, mixed black and reddish, or black and yellowish, the red and yellow hairs most numerous in the middle of the dorsum and low down on each side of the body, and varying in color from a bright brick-red to a pale straw-yellow ; spiracles yellowish-brown, ringed with black ; head black, the sulcus on top between the two lobes, usually the sides and lower margin of the clypeus and a dot at the base of each antennæ, yellow, mouth parts marked with yellow, anal and abdominal prongs largely pale yellowish. Length, 36 mm.

Found a great many from one-half to nearly full grown feeding upon various plants at Santa Monica, California, March 14, 1891. Placed leaves of *Malva borealis* in their cage, and they fed greedily upon them. One moth issued July 29 ; at this date there were two chrysalids and ten larvæ ; the remaining moths issued in August and September. All the moths bred had the black thorax.

Hemileuca electra Wright.

Body black, thickly dotted with white ; an indistinct broken black dorsal line bordered by a white line ; a yellowish or white subdorsal and two stigmatal lines, one of the latter above and the other below the spiracles ; spines short, in thin spreading clusters, those in the two dorsal rows simple except on segments one and two, in the other rows a branched spine arises from the middle of each cluster, each branch terminating in a long slender bristle ; body thinly covered with short stiff white hairs, not concealing the ground color ; head shining black, thinly covered with short stiff white hairs ; space between the two stigmatal lines less dotted with white than the remainder of the body ; sutures more or less brownish ; spiracles brown, ringed with black. Length, 45 mm.

Found several on *Eriogonum fasciculatum* on a high hill near Riverside, California, April 12, 1887. One pupated May 8, and the moth issued November 1, of the same year.

PROCEEDINGS OF THE NEW YORK ENTOMOLOGICAL SOCIETY.

MEETING OF DECEMBER 21, 1897.

Held at the American Museum of Natural History.

President Palm in the chair. Ten members and several visitors present.

The resignations of Messrs. Pike and Kùchler were read and accepted.

Mr. Groth moved that the President appoint a committee to propose names for the officers for 1898. Accepted. Messrs. Beutenmùller, Zabriskie, Groth and Daecke were appointed to serve on this committee.

Mr. Shoemaker read a paper on "Sugaring for Moths," in which he stated that he had collected during the past summer at Aqueduct, Long Island, from June 16th to October 16th, and that he had taken 118 species of Noctuidæ on 26 trips, and amongst which were species of *Agrotis*, *Teniocampa*, *Scopelosoma*, *Cucullia*, *Plusia*, *Hadena*, *Mamestra*, etc. His method of collecting was to suspend dried apples that had been strung on a copper wire and soaked in the sugaring mixture. These were hung on bushes and small trees along thickets. While the usual bait of beer, molasses and rum was attractive to the moths, he found that adding a little asafoetida rendered the mixture still more attractive, and that the moths would prefer this mixture to the former. He stated that weather conditions most favorable to collect in were clear, dark nights with a light breeze, and that it made no difference if it was warm or cold. There were few moths flying on moonlight nights. During the summer he spent several days collecting in the same locality for Lepidoptera and took *Argynnia idalia*, *Pamphila pontiac*, *Chrysoph. thoë*, *Neonympha canthus*, *Acontia delecta*, *Doryodes bistriaris*, *Cilla distema*, and also pupæ of *Hydræcia necopina* in stalk of wild sunflowers.

Mr. Blackburn, exhibited a book of butterflies, which proved a novel way of mounting them. He explained that by taking some paper slightly gummed and pressing the wing between two pieces, all the scales would adhere to the paper and by painting in the body of the insect in its proper place, a perfect representation of the insect could be obtained. After discussion, adjournment.

MEETING OF JANUARY 4, 1898.

Held in the American Museum of Natural History.

President Palm in the chair. Twelve members present.

The Treasurer's Annual Report was read, approved and referred to the Auditing Committee.

The following officers for 1898 were elected. President, Dr. E. G. Love; Vice-President, G. F. Groth; Treasurer, L. H. Joutel; Recording Secretary, E. Daecke; Corresponding Secretary, Ernest Shoemaker; Executive Committee, Messrs. Zabriskie, Palm, Daecke, Hug, and Dr. Ottolengui; Publication Committee, Messrs. Beutenmùller, Joutel, Schaeffer and Groth.

Rev. Zabriskie exhibited a small Proctotrypid Hymenopteron, *Dryinus*, sp., with chelate anterior tarsi. He referred to the fact of the Hymenoptera being in general beneficial to man, because of their preying, as captors or parasites, upon injurious insects; the Proctotrypidæ being especially beneficial as parasites upon the

smaller insects, and largely upon insect eggs. The Dryinæ are said to confine their attacks to small hymenopterous insects such as Jassidæ, etc., and to live in small felt-like sacks protruding from the abdominal spiracles of the host. A curious feature found only in this one sub-family of hymenoptera, is that of the chelate anterior tarsi of the females. These chelæ are formed somewhat on the plan of the formidable pincers of the lobster, although relatively more slender. They are outgrowths from the inner side of the fourth tarsal joint and are of comparatively large size, so that when opened in a straight line, the expanse is nearly equal to the combined length of all five tarsal joints; when the two members of pincers are closed together, the lid is folded upward against the inner side of the first, second and third tarsal joints. They are probably used for holding the prey when the female is ovipositing.

Mr. Beutenmüller showed a number of remarkable Australian Hepialids from Mr. Schaus' collection; among which were *Zelotypia stacyi*, *Hepialus virescens*, *H. swainsonii*, *H. daphnandra*, *H. eximia*, *H. splendens*, *H. lignivorus* and *H. lewinii*.

Mr. Joutel spoke on the protective habit of *Cotalpa lanigera*. He stated that the beetle, which is bright yellow and a very conspicuous object, has the habit of drawing the edges of the leaves together with its claws, so that it is completely hidden. Several may be on the same bush, but from this habit not one will be seen. He also exhibited eggs of the common walking-stick. They very much resemble seeds, in color, size and shape. Adjournment.

MEETING OF JANUARY 18, 1898.

Held at the American Museum of Natural History.

President Dr. Love in the chair. Eleven members present.

The Auditing Committee reported on the Treasurer's accounts as being correct.

Dr. Ottolengui spoke on the genus *Plusia* and pointed out the relative differences and doubtful nomenclature of various species of this genus.

MEETING OF FEBRUARY 1, 1898.

Held at the American Museum of Natural History.

President Dr. Love in the chair. Twelve members and several visitors present, amongst which were Professor Smith, Messrs. Southwick and Ormond.

Mr. Joutel proposed Mr. W. T. Davis for membership.

The President appointed Messrs. Zabriskie, Palm and Beutenmüller, to form an auditing committee for 1898, and Messrs. Loss and Munch as the field committee.

Mr. Crampton spoke upon experiments upon the grafting of pupæ of Lepidoptera. He described in detail a series of experiments upon pupæ performed during the spring of 1897. These experiments, he added, were similar to those made by Dr. Born upon the coalescence of portions of different embryos of Amphibia. Besides the possibility of coalescence of two individuals or parts of individuals, there appeared in the Lepidoptera experiments certain other interesting problems, which related chiefly to the causes producing the magnificent colors of the imago. From the work of Mayer and others it has been shown that the pigmented colors are produced by the chemical decomposition of the hæmolymp in the empty scale cells. Hence, *a priori*, it might be possible to produce reciprocal color effects of one moth upon another differently colored moth by uniting the hæmolymp of each with that of the other. The problem of heredity involved in such cases, as *C. promethea* where the male and female

are of different colors is the question whether the gonad of a certain sex and the color, are both the effects of a common set of causes, or whether the color is more directly dependent upon the gonad of a certain sex. As the color is produced by a chemical decomposition of the hæmolymp, and as the hæmolymp can hardly escape being reciprocally affected chemically by the sexual organs, the second of the assumptions would be indicated.

The results so far obtained, however, do not warrant any final opinion upon this subject. The pupæ used were those of the common Saturnidæ, *Callosamia promethea*, *Platysamia cecropia* and *Telea polyphemus*. A cartilage knife or razor was used in cutting the pupæ. The two portions to be united were placed in apposition and melted parafine was applied with a camel's hair brush to the edges of the common wound. The cooled parafine formed a ring which kept the parts together and prevented the escape of the hæmolymp. Three groups of operations were recognized according to the make-up of the complex. First, where parts from two different pupæ were united in normal proportions.

Homoplastic operations upon *Cynthia* furnished three successful cases. Only one heteroplastic union was obtained. In this specimen a part of the abdomen of a female *promethea* was united to the rest of the body of a *cynthia*. The part of the imago derived from the *promethea* showed no trace of a red color, but was buff, the ground color of the *cynthia*. "Tandem" fusions formed the second group. In these a head was cut from one pupa and a part of the abdomen of the other, the parts being united on a long axis. The resulting moths possessed four pairs of wings and six pairs of legs. Heteroplastic and homoplastic.

Twin unions formed the third group. In these but little of each pupa was cut off. Moths joined by the heads, by their backs or tails or sides could be produced by corresponding operations. In some of the heteroplastic unions, however, was there any indications of reciprocal color effects.

In summary it was pointed out that homoplastic unions were easier to produce than heteroplastic ones. Eleven per cent. of the latter was successful, while fifteen per cent. of the former furnished imagines. The mortality was greatest among the pupæ of the first group, only six surviving the operation. The "Tandem" give a percentage of success of eleven. The "Twins" furnished twenty per cent. of successful operations. He hoped that future operations and experiments will furnish data for the solution of the problem of reciprocal color effects. After a lengthy discussion the meeting adjourned.

MEETING OF FEBRUARY 15, 1898.

Held at the American Museum of Natural History.

President Dr. Love in the chair. Eight members present and several visitors.

Mr. Davis was elected an active member.

Mr. Beutenmüller exhibited specimens of the curiously formed butterflies, *Armandia lidderdalii* and *A. thaidina*.

Mr. Joutel showed living specimens of *Ceruchus piccus* in decayed white birch. After discussion, adjournment.

MEETING OF MARCH 1, 1898.

Held at the American Museum of Natural History.

Vice-President Groth in the chair. Twelve members present.

Mr. Ditmars read a popular paper on the Transformations of Insects, and described in some details the main characteristics of the different orders. He also exhibited a series of prepared specimens of transformations preserved in alcohol and some anatomical models.

A brief note from Dr. Kunze on *Euchloë pima* was read by Mr. Beutenmüller. He stated that *pima* is single brooded and flies in Pima and Maricopa Co., Arizona, principally during March. Dr. Kunze took it also on February 28, 1898. *Pima* rifles the flowers of a hirsute plant called *Amsinckia spectabilis* and stated that he never observed it feeding on any other plants. It is difficult to differentiate between the sexes on the wing, as both are exactly alike in color. Besides the female is very scarce and about in proportion as 1 to 20.

Mr. Beutenmüller exhibited about 100 species of Sphingidæ from Mr. Schaus' collection. Amongst which were *Ambulyx substrigalis*, *A. rubicosa*, *Pterogon gorgonides*, *Sataspes infernalis*, *Maruba roseipennis*, *Amblypterus panopus*, etc.

MEETING OF MARCH 15, 1898.

Held at the American Museum of Natural History.

President Dr. Love in the chair. Fourteen members and visitors, Messrs. Kearfott and Southwick, present.

Mr. Southwick read a paper on the economic entomological work done in the parks of New York City.

He enumerated and described in detail the various insects and the modes of destroying them, the scraping of the egg-masses and cocoons in winter and the spraying of the foliage in summer.

Mr. Southwick described the various emulsions for the destruction of insects, and stated that a mixture of London purple against the Elm beetle was very effective. The work against the beetle is begun about the middle of May by spraying and again about June 6th for their larvæ with an emulsion of soft soap, kerosene, carbolic acid and water. The various borers are treated with bisulphide of carbon. Fungi which promptly appear after trees have been wounded are scraped off and the affected places painted with celluloid. The bag-worm, *Thyridopteryx ephemeraformis*, formerly very abundant, has almost entirely vanished from the parks by effective work; similarly the scale-louse, *Pulvinaria innumerabilis*, formerly common in the parks, has almost entirely disappeared from that place. The speaker pointed out the effective work which is constantly in progress against a number of other injurious insects, such as the *Orgyia*, different species of *Datana*, *Hyphantria*, oyster-shell bark louse (*Mytilaspis*) and different Hackberry Galls (*Pachypsylla*).

In conclusion the speaker showed a number of tools used for economic entomological work, such as knives, scrapers, spraying nozzles, etc.

Mr. Palm exhibited some rare Coleoptera collected by Dr. Kunze in Arizona.

Mr. Kearfott showed a box of inflated larvæ. After discussion adjournment.

MEETING OF APRIL 5, 1898.

Held at the American Museum of Natural History.

President Dr. Love in the chair. Ten members present.

Dr. Seifert spoke on experiments of heat and cold upon pupæ of Lepidoptera. He stated that larva exposed to an abnormal degree of heat or cold showed no visible

differences in the imago, pupæ, however, exposed to heat yield images of darker and more intense coloring, while such exposed to a longer period of abnormal cold will produce comparatively lighter effects. Excessive moisture causes a scarcity of scales and gives the wings a glassy semitransparent appearance. He exhibited a number of specimens produced by abnormal temperature.

Mr. Davis spoke on the dragonflies of Staten Island.

Mr. Beutenmüller exhibited a nest of *Vespa crabro* from Europe. This nest had evidently been built between the rafters of a house, being covered with a very brittle wood-pulp from which the resinous substance exuded, giving the nest a variegated appearance. Usually this species builds its nest in a hollow tree.

Mr. Groth exhibited a series of biological sets and transformations of Wasps. After discussion, adjournment.

MEETING OF MAY 3, 1898.

Held at the American Museum of Natural History.

Dr. Love in the chair. Ten members present.

Mr. Schaeffer made some remarks on the genus *Onus*, and exhibited *O. lecontei*, *edwardsii*, *sequoiarum*, *californicus*, *audouini*, *ambiguus* and *dejeanii*, all from the Museum collection.

Mr. Beutenmüller spoke on the genus *Euchloë* and pointed out that the American species may be placed into three groups according to venation, *Midea*, *Euchloë* and *Anthocharis*.

After discussion, adjournment.

MEETING OF MAY 17, 1898.

Held at the American Museum of Natural History.

President Dr. Love in the chair. Ten members present.

The publication committee reported that they discussed the expediency of holding an auction sale of insects for the benefit of the JOURNAL.

Dr. Love proposed the following amendment to the constitution and by-laws:

"Resolved, That Article XVI be amended by inserting the words 'and September' after the word 'August' and by the omission of the word 'and' between the words July and August."

The resignation of Mr. Nushardt was read and accepted.

Mr. Dæcke gave some notes on *Thecla damon*, in which he stated that this creature had the habit of dropping to the ground when disturbed, and owing to its green and brown colors was difficult to detect amongst grass.

Mr. Beutenmüller, stated that the Museum collection of Coleoptera is now being arranged, and he estimated that it contained at least 150,000 specimens.

A general discussion of the species of *Cicindela* was held, after which followed adjournment.

MEETING OF JUNE 7, 1898.

Held at the American Museum of Natural History.

President Dr. Love in the chair. Eight members present and several visitors.

Mr. Beutenmüller announced a donation by Mr. Schaus of \$50.00 to the JOURNAL fund and it was moved and accepted that the Secretary forward a letter of thanks to Mr. Schaus for this generous donation.

The amendment to the constitution and by-laws announced at the previous meeting was accepted.

Mr. Schaeffer proposed for active membership Messrs. Joseph E. Graef and F. A. Stinner.

A discussion on the species of the genera *Pamphila* and *Leptura* was held. Adjournment.

MEETING OF JUNE 21, 1898.

Held at the American Museum of Natural History.

President Dr. Love in the chair. Eight members present.

Messrs. Stinner and Graef were elected as members of the Society.

Mr. Beutenmüller proposed Mr. W. D. Kearfott for active membership.

After a discussion on various topics the meeting adjourned until October.

MEETING OF OCTOBER 4, 1898.

Held at the American Museum of Natural History.

President Dr. Love in the chair. Eight members present.

Mr. Kearfott was elected as member of the Society.

It was moved and accepted that a vote of thanks be extended to Mrs. A. T. Slosson for a number of rare *Lepidoptera* which she donated for the auction sale.

Mr. Joutel made some remarks on a curious variety of *Spilosoma latipennis* which had yellow forelegs. He stated that these were bred from eggs of a specimen which had pink forelegs, the normal form.

Mr. Beutenmüller spoke on the observations made by Dr. Seifert on three closely allied species of *Arctia*—*nais*, *phalerata* and *vittata*, and proved the validity of these three species.

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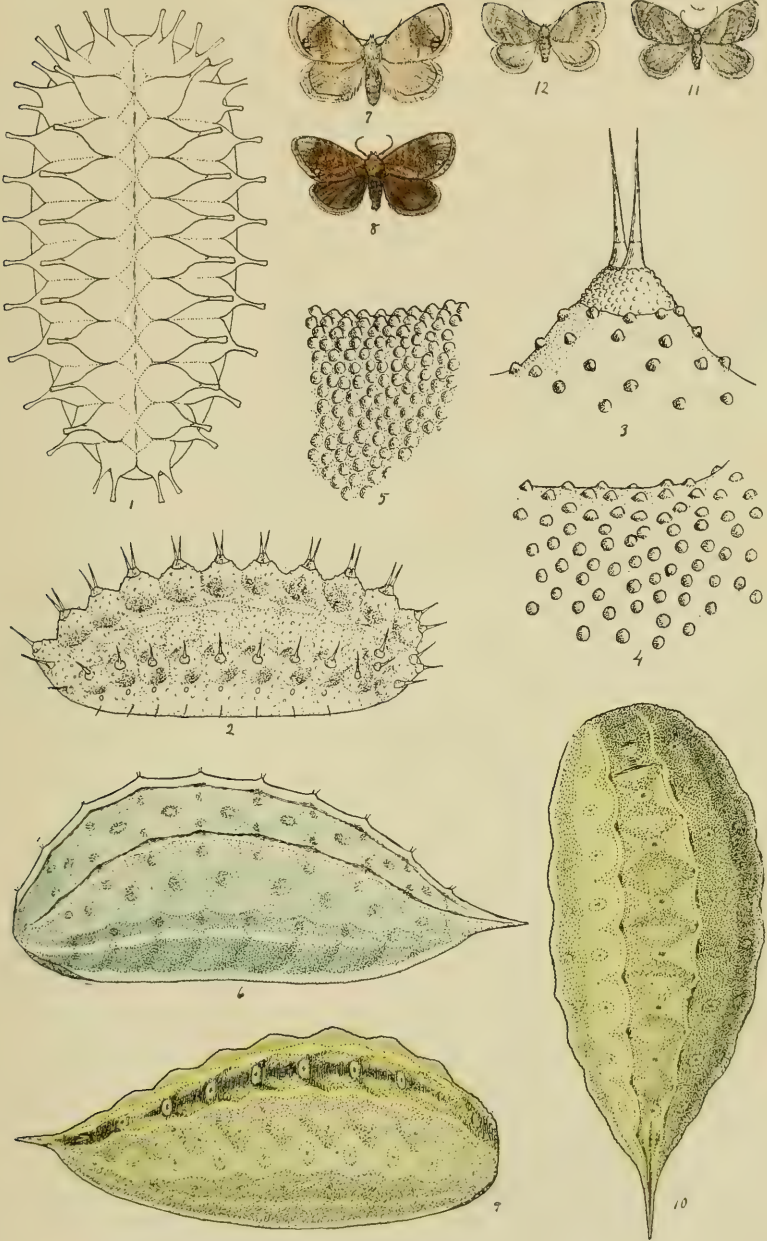
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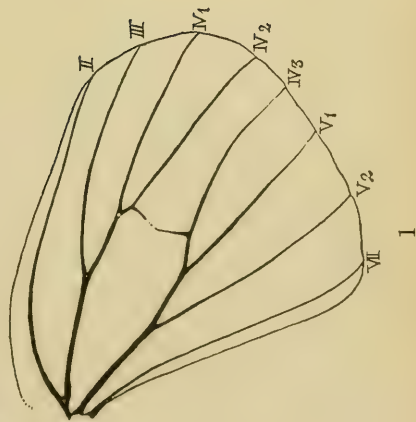
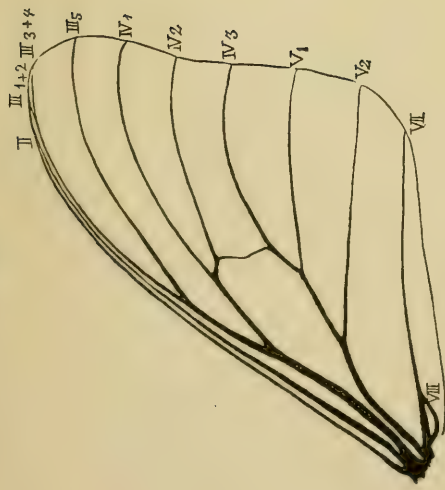
ERRATA.

Page 45, for *Eurinæxilis*, sp. nov., read *Eurina exilis*, sp. nov.

Page 194, line 9, for immediate read immaculate.

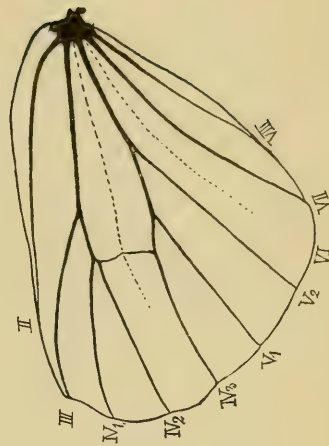
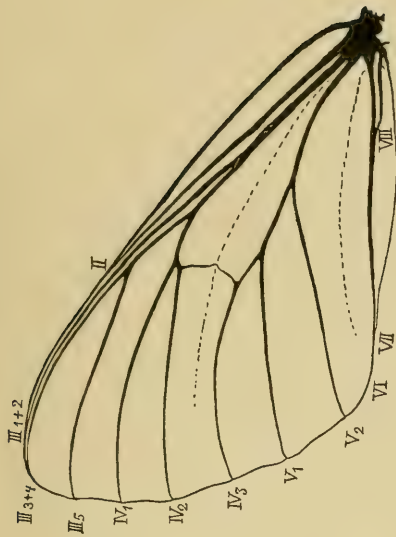


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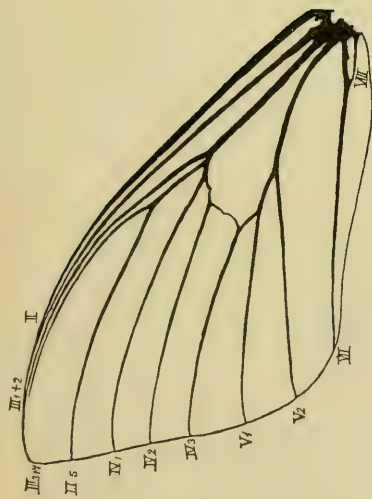


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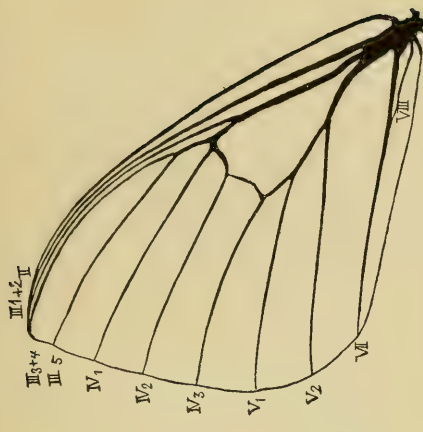
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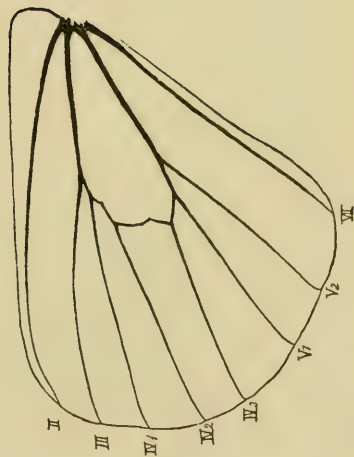
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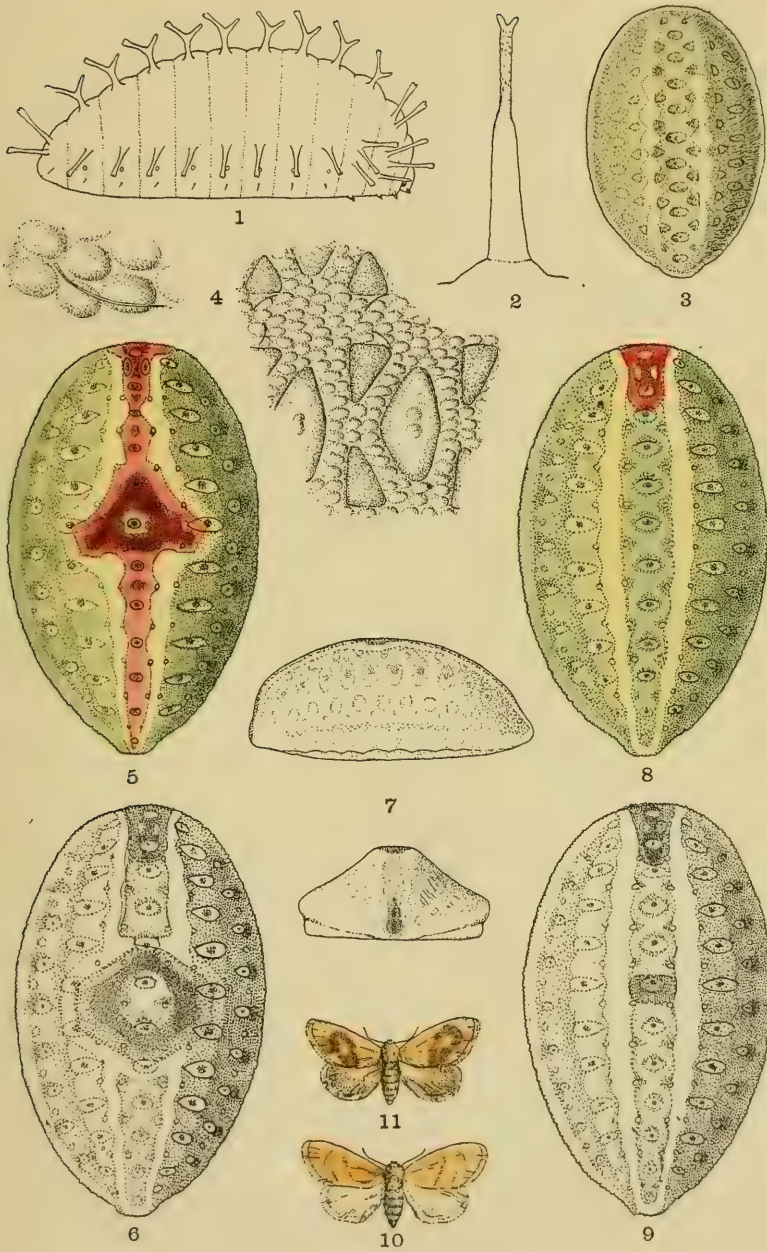




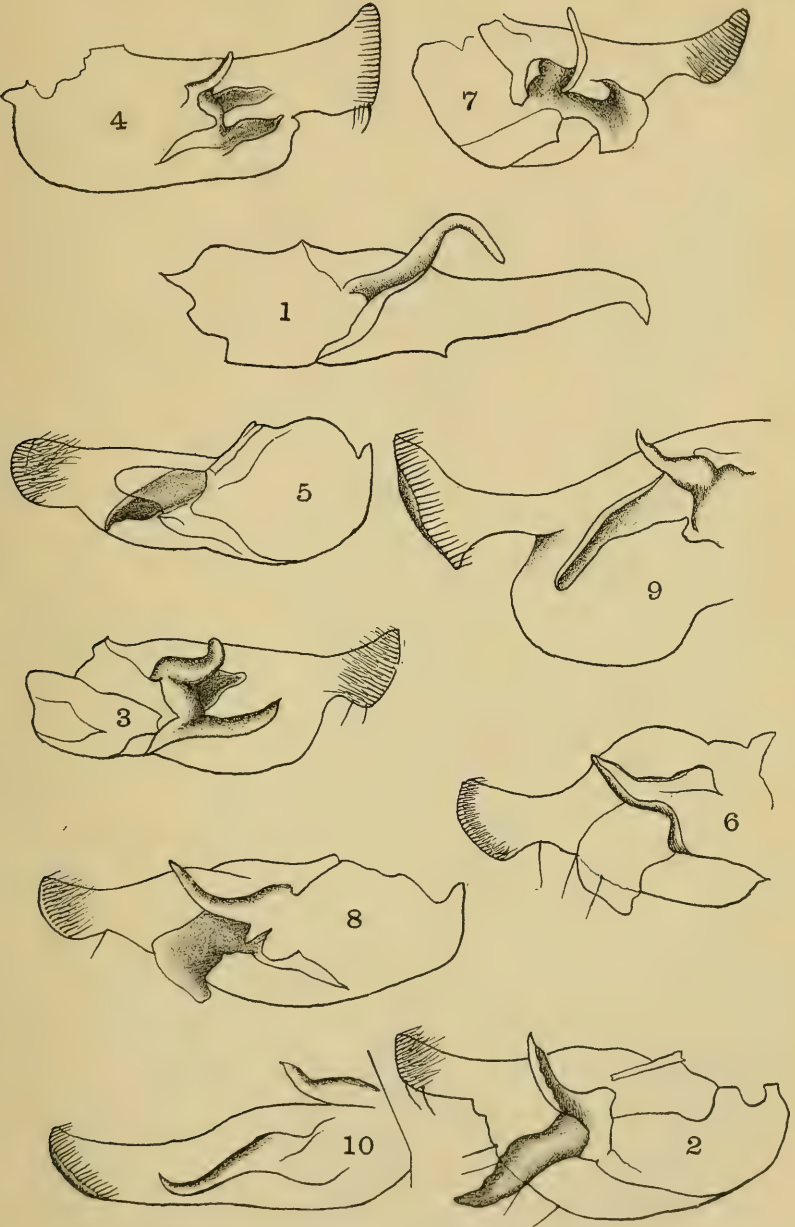
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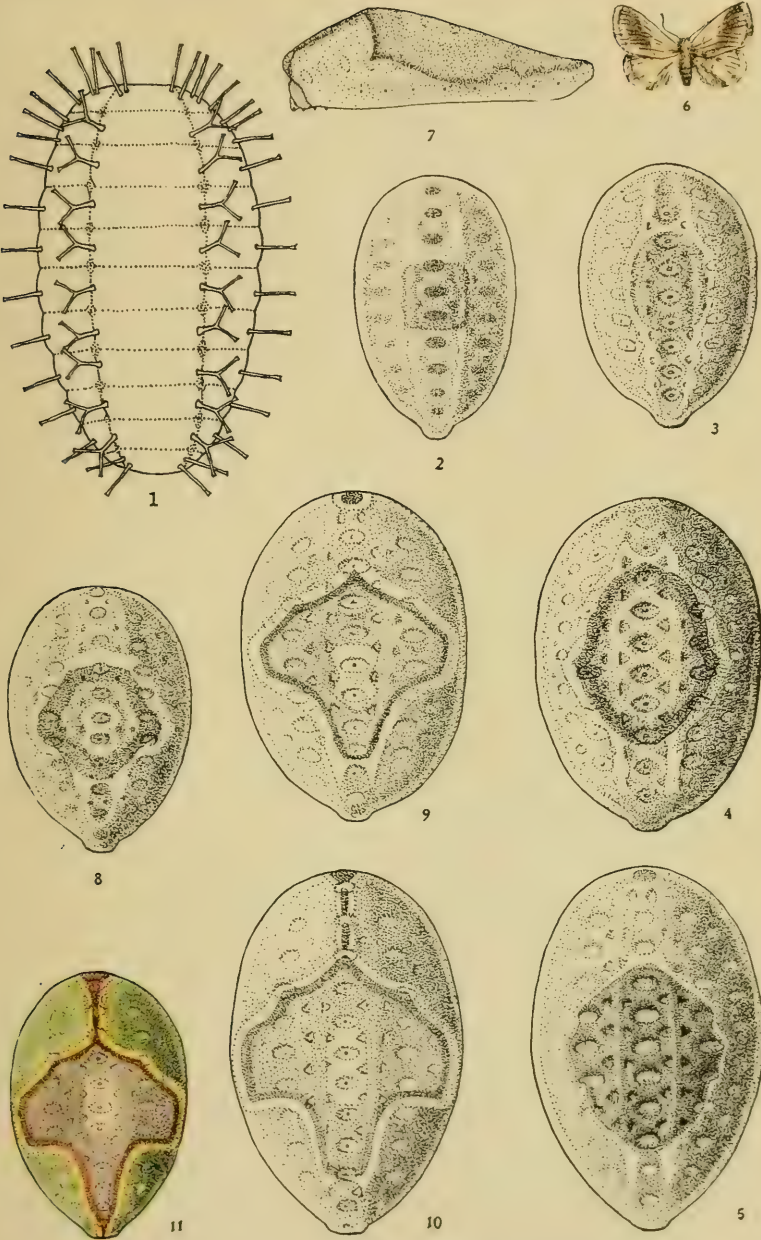
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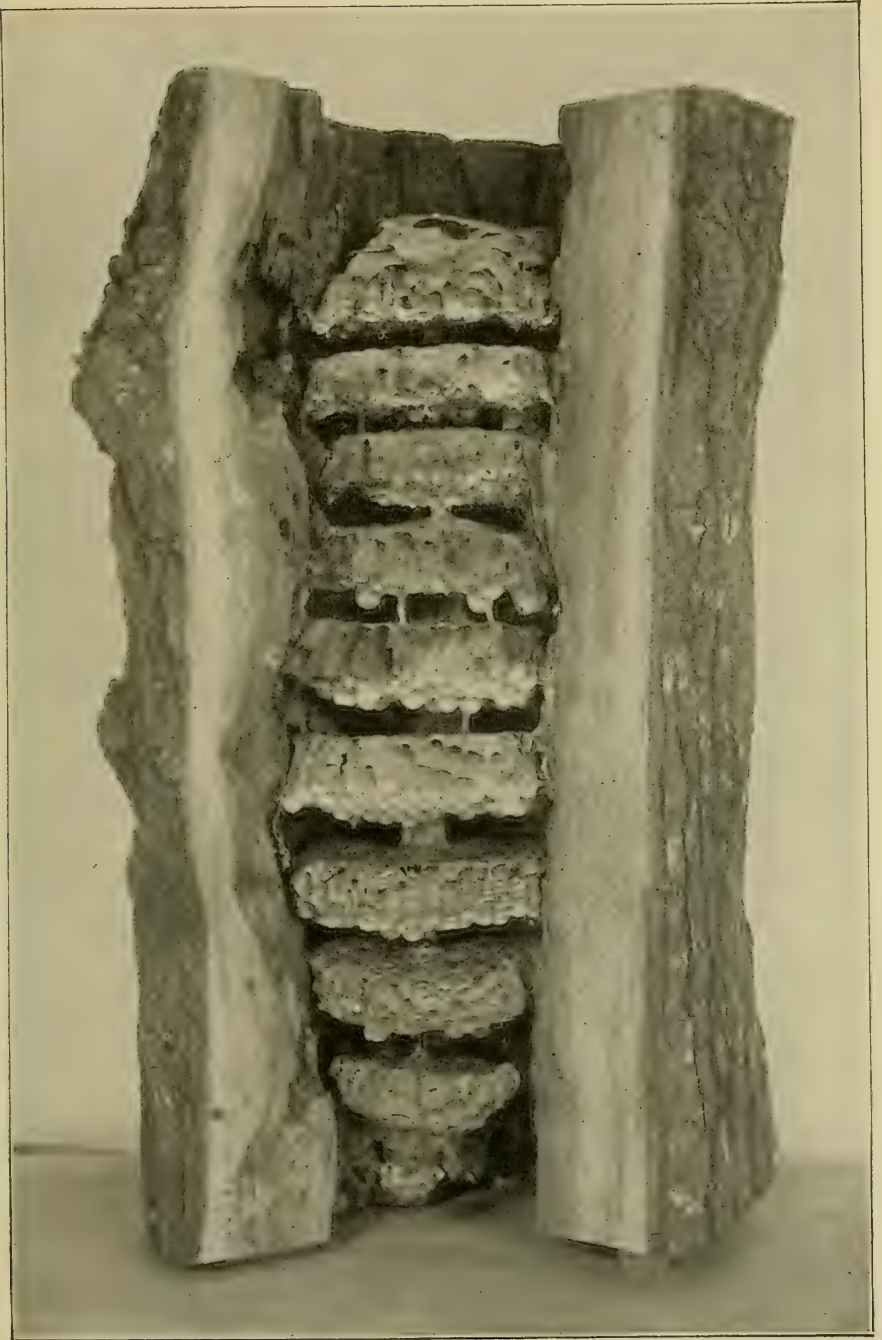
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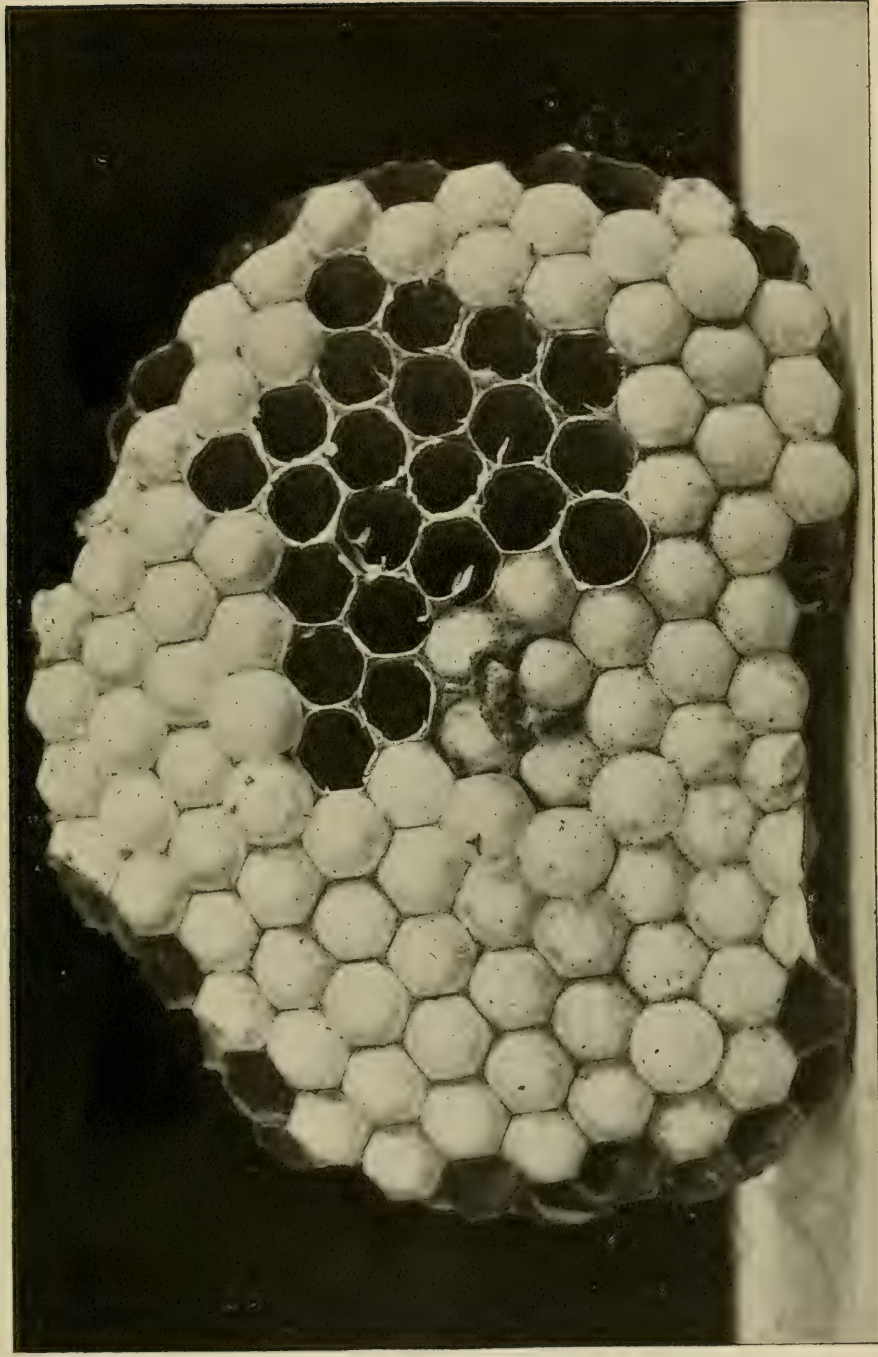
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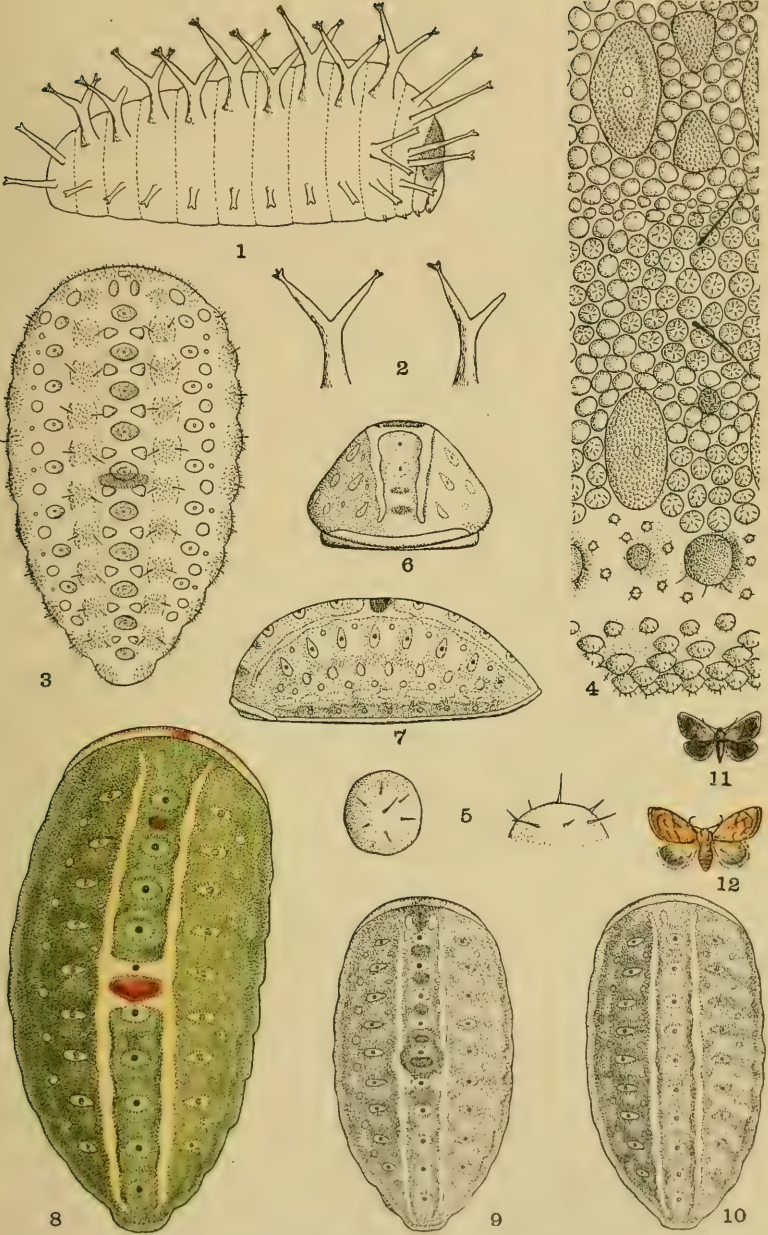


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Nest of *Vespa crabro*.

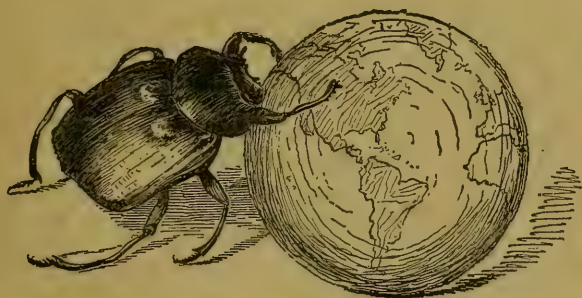




Life-History of *Heterogenea shurtleffii*.

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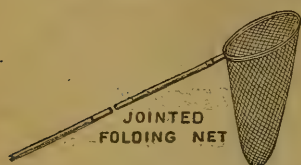


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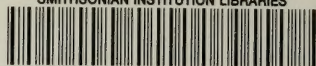
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